American Machinist

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1,500 Units a Day

Accurate to 'tenths'

Extreme tolerances in mass production of Majestic refrigerator parts call for cooperation between inspection and manufacturing

A FEW years back the expression, working to thousandths of an inch, was held in considerable awe and considered an ideal of the inspection department rather than a practical shop standard. But times have changed, and tolerances of this order are now just daily routine. In few plants, however, do we hear tenths of thousandths of an inch tossed around with any degree of indifference. Such figures belong normally in the tool room, and the precision machinery that does the work is boxed off in glass cages to elevate the "tenth" to its proper dignity.

To introduce tolerances of such a nature on mass production work would seem to invite disaster or to raise costs to a prohibitive amount. Yet the "tenth" is a regular production tolerance at the Grigsby-Grunow Company plant in the manufacture of the pump unit for the Majestic refrigerator—not without a struggle, of course, nor without the more-than-usual amount of obstacles that had to be overcome.

In this unit the heart of the system is a small vane-type pump that compresses the SO_2 gas prior to liquefication. With a rotor $1\frac{1}{2}$ in. in diameter and $1\frac{1}{4}$ in. long, the volume of gas handled per revolution is very small so that it is essential to control all clearances within very close limits. Errors of the nature of 0.0005 in. on certain key dimensions would appreciably reduce the efficiency. Coupled with such accuracy is the necessity for a fine finish, reflected in long life of the hardened parts.

With production varying from 500 to 1,500 units a day, the function of inspection is no longer that of an outside, disinterested agency. Inspectors literally become staff members of the production department, often have their benches among the machines, and work in close contact with the operators. Inspection is so definitely tied up with production that every facility must be given the workmen to check their own work. Hence the same precision gaging equipment is available to them as to the inspectors. In fact where inspection is carried on among the machines, the operators are free to use the inspectors' gages as well as their own for constant check on their output. Such an arrangement has resulted in harmony and close cooperation between the two groups, without which success would be impossible.

Working to ten thousandths of an inch on such a production basis would not be feasible, however, and would result inevitably in a high percentage of rejections were it not for selective assembly and, carrying the idea a step further, selective manufacture. In addition there are salvage sizes to which rejected material can be reworked. For example, if the rotor slots are consistently running wide by a few tenths, it is possible to control the width dimensions of the vanes to correspond. Correcting out-of-parallel slot walls by regrinding to a greater width creates a similar result for which the answer is the same. In other words, shrinkage of the product is kept down at the expense of greater complication in manufacture and assembly.

Selection by size is also carried back into the finish grinding operations so that the parts can be segregated for lapping. Rotor ends, for example, are lapped in groups of seven, and for final exact sizing it is essential to have the ground rotors segregated by tenths.

In dealing with dimensions of this order, cleanliness is important. Even a particle of dust will affect the reading of an indicating gage. Fine hones for burr removal constantly serve both operators and inspectors. Vigilance in the maintenance of gaging equipment is another essential. Gages reading to tenths are checked against masters twice daily; others, daily or every three days.

There are seven principal parts of the refrigerator pump or compressor. Three of them, the rotor, body and cap, are made from cold-rolled Jalcase, a free-cutting steel resembling S.A.E. 1020, while the bearing plate is

a forging of similar material. All four are gas carburized to a depth of 0.02 to 0.03 in. and hardened to 60-65 Rockwell C-scale. The vanes, rockers, and pins are made from an oil-hardening tool steel, heat-treated throughout to the same Rockwell reading. Before leaving the heat-treating department all hardened parts are electrolytically de-scaled. Most of these parts are finish ground all over, lapped on some of the key dimensions, and buffed to remove burrs.

The piece carrying the greatest number of operations and the most diverse is the pump rotor, Fig. 1. All the work is done on centers, which are lapped by hand in an Ashland Russel machine. Automatic index loading is used for the first grinding operation, Fig. 2, which is an in-feed grind to undercut the shank between bearing points, done on an Arter machine. All the operator has to do is load the turret by hand and check the work as it is discharged. In the grinding position, the piece is automatically chucked between pneumatically operated centers. Roughing of the bearing seats and of the O.D. of the head follows in Cincinnati 8x18-in. cylindrical grinders. About 0.004 in. of metal is left for finishing in similar set-ups. All these machines are loaded by hand. In the finish grinding operations, Pratt gages with Federal dial indicators, Fig. 3, are run on the work to give the operator size control by hand feed. For the shank, because of the shoulder at the head, and for the head itself, straight in-feed grinding with a wide wheel is used.

Bearing seats are held within +0.0003, —0.0001 in., with a maximum taper of 0.0001 in., and are later segregated by tenths at the final inspection. For the head, the tolerance is +0.000, —0.0005 in., with a taper not to exceed 0.0002 in. Eccentricity of the rotor body with the shaft is held within 0.0002 in. In order to obtain true running conditions, for this last check, the shank is supported in half bearings, instead of in V's, and the head indicated while turned by hand. Inspection of this kind is done alongside the machines.

In between these rough- and finish-grinding operations, the slots are ground in a "Universal" machine with dual heads, Fig. 4, as the work is held on centers. It is indexed between positions with the aid of a dog set by means of a fixture beside the machine. This is one of the key jobs on this particular part. Size is not as important as parallelism of the faces of the slot, as the vanes can always be varied in width and assembled selectively to obtain the required fit. Taper on length must not exceed 0.0003 in., and on the depth 0.0002 in. These factors are all within the control of the operator.

On the same table carrying the work-holding fixtures are a pair of diamonds for trimming the wheels. Upon the accuracy of set-up the entire results depend. The diamonds are mounted on a taper slide and have micrometer adjustment. Initial set-up of new wheels is also made from these diamonds, which are brought into contact position at the will of the operator. Since each wheel is grinding opposite sides of slots, the job is completed after the work has been indexed four times. Check of the slot width is made by go and no-go flat gages mounted in fours in the form of a cross.

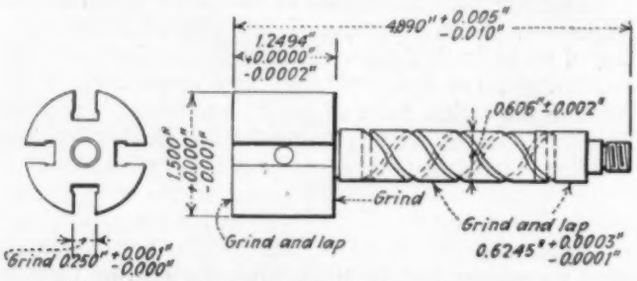


Fig. 1—Limits such as specified on this rotor demand unusual control in manufacture and inspection

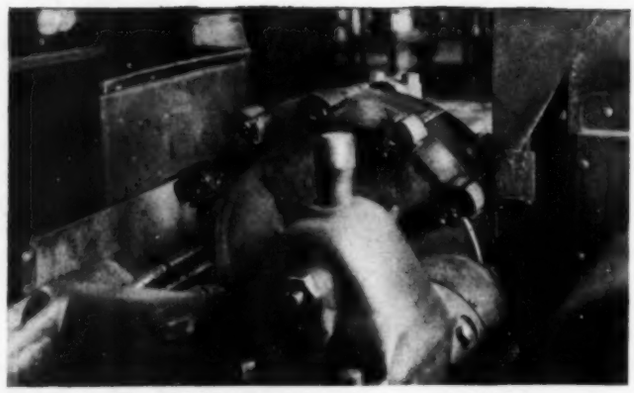


Fig. 2—Through the use of an indexing loading turret, undercutting of the shank becomes automatic. In grinding, the work is supported on centers

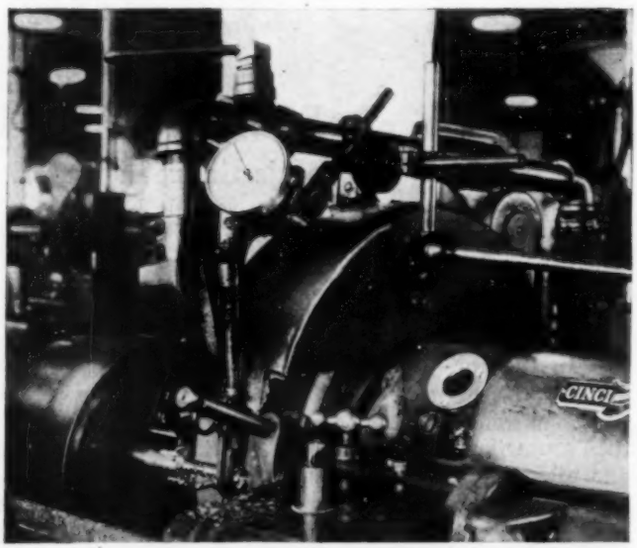


Fig. 3—Control of the in-feed grinding operation is obtained by an indicator running on the work

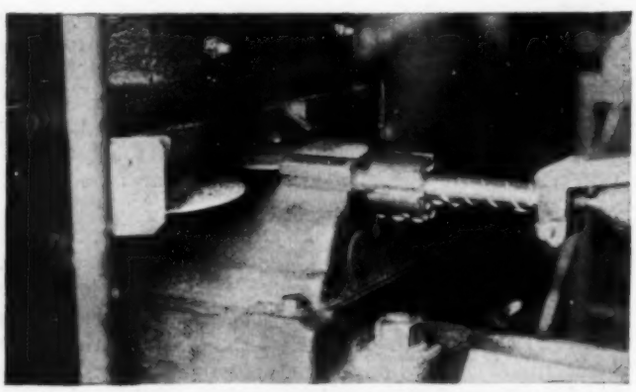


Fig. 4—Setting of the wheel the exact distance below center for the designated slot width is determined by truing diamonds set on the grinder table

Another ticklish operation is grinding the inside of the heads square with the shank. This surface must not only be square, but also so flat that no light can be seen underneath a straight-edge when held up to the light. This

work is carried on in a No. 2 B. & S. universal grinder, using a fine-edged flared wheel of large diameter. Results depend almost entirely upon the operator who combines hand feed of the work axially with in-feed of the wheel.

With assurance that the inside shoulder is square and flat, the final length of the body can be obtained by grinding the top of the head to suit. To do this, the rotors are loaded in a special chuck on the table of an 8-in. Pratt & Whitney surface grinder. In this set-up, Fig. 5, the work rests on the shoulder and the shank is clamped by spring pressure against V's. Furthermore, after the entire table is loaded and the work tapped into position, it is energized electrically to produce magnetic clamping in addition to mechanical. The counterbalanced wheelhead is fed by hand, and while stops are provided, in actual practice the operator judges the amount of cut by time intervals and gages the work as it nears completion. By means of a dial gage on a tripod stand, it is possible to check the height within a tenth without removing the rotor from the chuck.

This length of body is a key dimension and is later lapped to within +.0000, —0.0002 in. of size. Hence, very close check is kept on this surface-grinding operation. As the pieces are unloaded they are checked again with a go and no-go snap gage, and finally receive a formal inspection with a Zeiss projection Optimeter, Fig. 6. In this instrument the position of the index pointer and the scale are projected on a screen, so that the reading can be made readily. Reading direct in half tenths, it is possible to estimate to quarters if necessary. Here again the inspection bench is located among the machines and the Optimeter is available for product check by the operators as well as by the inspectors. Probably the greatest benefit of this system lies in the fact that serious errors can be found before pieces have been processed. The same instruments are found in the lapping room and in the final inspection section.

This completes the grinding of the piece. One lapping operation follows, that of bringing the head to final height. In the lapping department ground pieces are segregated by tenths with the aid of the Optimeter and are bolted at the ends into chucks holding seven pieces. A fixture on the Norton lapping machines, Fig. 7, holds eight of these chucks in an upside-down position. As all 56 pieces have the same amount of metal to be removed, control of the lapping operation is by time, a photographic clock with fractional minute dial and alarm being used for the purpose. About a minute is required to remove 0.0001 in. of material, using Norton 320 compound in keresene. As the pieces approach size the oper-

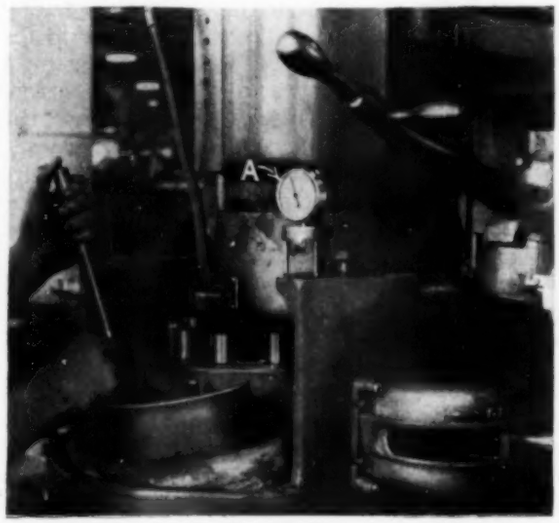


Fig. 5—Spring clamps, released by hand, hold the work which is further held magnetically in this critical surface grinding operation. At *A* is a dial gage and tripod for check and head height

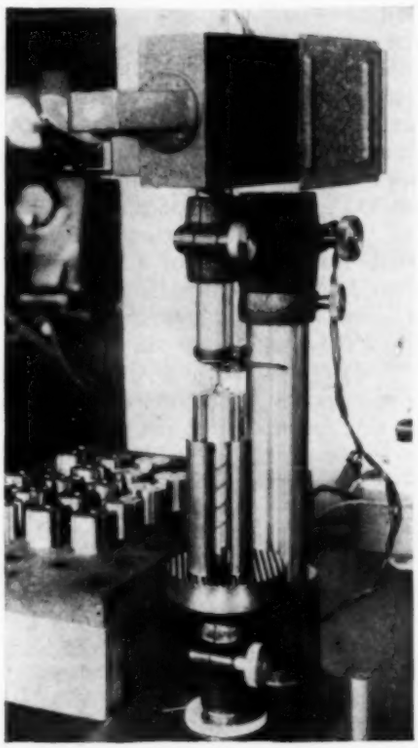


Fig. 6—A beam of light from a shrouded lamp projects the pointer and scale on a screen for quick reading to half tenths on the head dimension

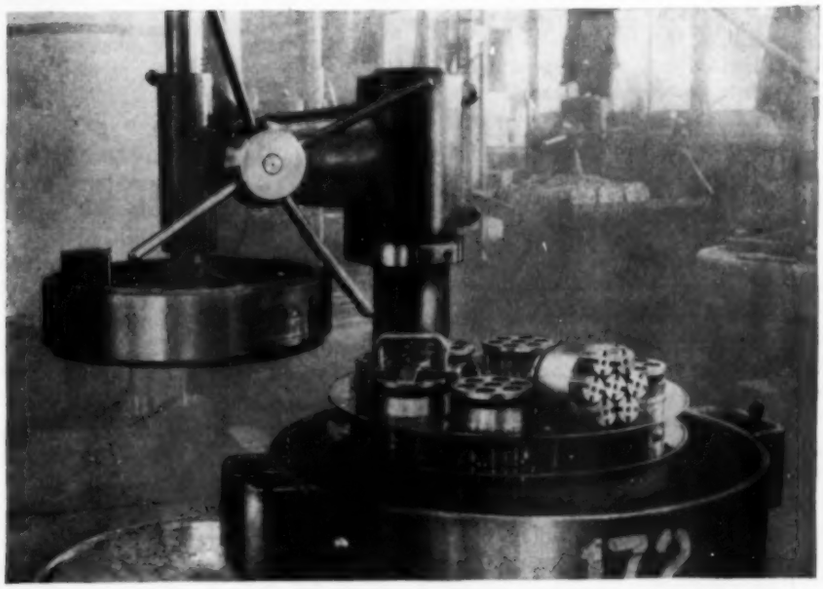


Fig. 7—Rotor heads are lapped in sets. On account of the sharp edges, a lifting grip is necessary for loading. Pressure is supplied by the head shown swung out of operating position

Fig. 8—Bearing diameters are read direct on this 3-point gage. The size is electrically etched with needle *A*, while the work completes the circuit through plate *B*

ator must stop the machine, unbolt two or three rotors at random, and check the size on the Optimeter. This is tedious, but it is the only way to insure accuracy.

Great care is necessary in gaging also. Fine burrs must be removed by hand stoning, and the gaged surfaces must be wiped dry and clean by rags and on layers of newspapers. Before going to the final inspection section, all pieces are buffed on cloth wheels, then wiped carefully with chamois. The king's silver couldn't be given any better treatment.

Final inspection of the pump rotor is largely a 100 per cent recheck on previously measured dimensions, using the same type of instruments. The diameter of the shank at the bearing next to the head is measured with a Krupp "Passameter," Fig. 8, and the size is marked on the undercut part of the shank in plus tenths by means of an electric etching needle.

The first of two articles.

Caring for Oil-Soaked Shoes

OCTAVE ANTONIO
Superintendent, A. A. Automatic Products Company

MEN operating machines that use oil as a coolant soon get their clothing saturated with oil, especially their shoes. In a short time the oil soaks through their shoes and to their feet, causing a disagreeable feeling. I have known of several ineffectual attempts on the part of workmen to remedy this condition. Some men soak their oil-saturated shoes in gasoline, which dissolves the cement and rots the leather, leaving it hard and dry. Some of the green men try wearing rubber overshoes, obviously meeting with ludicrous results.

I feel sure that any foreman having a helpful attitude toward his men can save them both trouble and expense by advising them as follows: Get a shallow box about 18 in. square and a pound of fuller's earth. Fuller's earth can be bought at any drug store for about 15 cents per pound. Sprinkle some of the fuller's earth over the bottom of the box for the shoes to rest on. Shake plenty of it into the shoes and set them in the box. Shake the balance of the fuller's earth over the outside of the shoes and leave them in the box overnight, or over the week end.

When the shoes are needed, the fuller's earth can easily be shaken out and dusted off. The shoes will be found to be as clean, dry and free from oil as when new. The fuller's earth can be used many times before it is necessary to renew it. I know that this method works all right, for I have used it for over a year.

High Wages and Prosperity

ANDERS JANSSON

SINCE quantity production is the basis of modern manufacture, and since mass production depends on mass demand, the spreading hysteria of wage cutting seems a diametrically short cut toward completing the vicious circle of depression. The debts of today must inevitably be paid out of the wages of tomorrow, before new contracts can be undertaken. Those economists who disregard the potential markets among the masses—whose buying power is curtailed to a point where bare necessities are a luxury—are going to have ample time for reflection unless they can agree that a wise man sometimes changes his mind and a fool never does.

This is not a slam at industry or those concerns that have cut wages as an alternative to shutting down; rather, it is a common sense plea for the reestablishment of higher wages at the earliest possible moment. It were far better for capital and industry to nurture the mass market, even though it entail a modicum of profit during the transition to better times than that it be so devitalized that recovery be indefinitely deferred. In the final analysis, the 10 cent store customer and the buyer of the flivver is a greater factor in the weft of our commerce than the occasional buyer of a steam yacht.

A recent editorial in *American Machinist*, "High wages, low costs," (*AM*—Vol. 74, page 186) assumes a new significance after a talk with recently returned visitors to the Scandinavias and other parts of Europe. Apparently those countries, while affected by the depression, have maintained the highest wages compatible with reasonable profit; more, several companies there have paid bonuses out of profits. Despite this, one large Swedish company has loaned direct or underwritten loans to other European nations totaling scores of millions of dollars. It is the writer's contention that what they can do, we can not only do, but we can do it better than they.

With a view toward advancing constructive criticism, the writer suggests, as an example, that if the manufacturers of copper goods hold a round table conference and agree to a price for raw copper that will net the producer a fair profit, the miners will, in due time, be potential buyers of the finished product, be it wire for building purposes, radios, washing machines or automobiles. Not being an economist, the writer has no means of determining the value of the suggestion, but until a better one is advanced it might be worth at least a passing thought. One thing is certain—if the hint doesn't put the idea across, volumes of supporting arguments would be futile.

LESLIE CHILDS
Counselor at Law

Fitness for Purpose

If a purchase order designates specific equipment and carries no specific warranties, the buyer cannot rely on an implied warranty of fitness for purpose

THE question, whether or not a buyer of machinery has a legal right to rely upon an implied warranty of fitness for the purpose purchased, may be of great importance to machinery builders, jobbing machine shops and other industrial plants—especially so where untried equipment is ordered without a sound knowledge of just what may be expected in the way of performance.

However, generally speaking, there will be no implied warranty of fitness of machinery, unless the buyer orders in such a manner as to place the responsibility for selection upon the seller. It follows, where a buyer orders certain, specific equipment, he will be deemed to take the risk of its fitness for his purpose. A fine legal point this, and its application may be illustrated by the following:

In a recent case of this kind, the plaintiff was engaged in manufacturing sand-blast equipment, and the defendant was attempting to perfect a new process in the manufacture of bath tubs that involved sand-blasting upon sheet metal. A representative of the defendant visited the plant of the plaintiff where he inspected the sand-blast room and dust arrester system while the machinery was in motion and the conditions when it was not in motion.

This representative reported favorably on what he saw, and as a result the defendant entered into a contract to purchase certain equipment and machinery of the plaintiff, for an agreed price of $3,103. This order, among other things, contained the following specifications as to what was to be furnished:

"One type NF complete room sand-blast equipment installation . . . consisting of steel plate room eighteen long by ten wide by 6.6 high, inside dimensions, complete with double panel, steel plate swinging, self-closing, self-sealing doors at each end of room; electric light fixtures, air inlet fixtures; ventilating ducts and room manifolding steel plate floor with round holes, and including steel supports for floor; monorail supports and pit fittings."

So much for the room. Then in respect to the sand-blast machinery proper, the order continued:

"Two No. I type AU-S direct pressure hose sand-blast machines with single air valve control of air and abrasive including two pendant hose lines, sand-blast accessories and supports; two abrasive handling and reclaiming screens for direct motor drive (purchaser . . . to furnish 3 H.P. 1200 NRPM motors) complete including two type BV-2 abrasive separators; two type IC-I abrasive elevators; 2 type JF-2 abrasive conveyors; abrasive storage bins, etc."

In addition, the order provided for the dust arrester equipment with the same degree of particularity as was employed above. And, while the plaintiff had full knowledge of how the defendant proposed to use this equipment, the order contained no warranty of fitness for this purpose on the part of the plaintiff.

The plaintiff entered upon the work and manufactured the equipment in strict accordance with the terms of the order and instructions furnished by the defendant. In the meantime, however, the defendant had made a further investigation as to whether or not it could successfully apply sand-blasting operations to the kind of product it had in mind. This investigation, it seems, convinced defendant that a mistake had been made and that the equipment would not serve its purpose.

Defendant thereupon refused to accept the equipment. Plaintiff brought suit for the purchase price. In defense the defendant, among other things, set up an implied warranty of fitness on the part of the plaintiff. This, it appears, was grounded upon the proposition that since plaintiff knew the purpose for which defendant intended to use the equipment, there would arise an implied warranty of the fitness of the equipment for this purpose.

The trial court held against this contention, and rendered judgment for the sand blast manufacturer for the contract price. The defendant appealed, and the higher court in affirming the judgment, in part, said:

"The question then here presents itself: Can an implied warranty be raised in connection with a contract for the manufacture and sale of machinery which is described in detail in the contract, as hereinbefore set forth? We note that the equipment to be furnished . . . was described with great definiteness and particularity; that blueprints were submitted to [defendant] on different occasions; and that the final details of the equipment were worked out according to the suggestions of the officials of [defendant.]

"We therefore believe it to be the law of this state, and of other jurisdictions, that where articles which are the subject-matter of a contract are known, definite and described, the purchaser assumes all responsibility for the use of such articles for any purpose which he intends them to be used, and this rule obtains notwithstanding the fact that he may have indicated to the seller the use to which the articles were to be put . . . Judgment affirmed." (175 N. E. 615)

The foregoing case was carefully reasoned by the court and constitutes a fair illustration of the general rule applied in cases of this kind where a buyer of machinery attempts to invoke the implied warranty fitness rule, in the face of a contract for goods that details just what is to be furnished. In other words, the general rule is that if the order designates specific equipment, there will arise no implied warranty of fitness for the purposes of the buyer, and the latter will be held to have assumed this risk.

Truly, the foregoing case illustrates the application of a rule that may well be had in mind by buyers of machinery and equipment in situations of this kind. And if such a buyer intends or desires to hold the seller to a warranty of fitness of purpose, it is usually a good policy to have a stipulation to that effect in the contract of sale, as insurance against later disputes thereon.

The Foreman's Round Table

On the Spot

"NOW see what you've done, Ed," hailed Al as he joined his friend at the lunch table. "I knew the axe would fall some time."

"Wait a minute, wait a minute. Don't ever interrupt a religious ceremony. Gimme that bill-of-fare."

"I can save you lots of time, fella. Bring Ed ham and eggs, waiter," interjected Al.

"All right, now what do you mean? What have I done, and what axe?"

"Didn't you get that notice just before 12 o'clock?"

"No, thank goodness, or I probably wouldn't have wanted any lunch."

"You're just tootin' you wouldn't. I think this order was aimed particularly at you," teased Al. "You'd better carry it in your inside pocket so you can consult it frequently. See, I've got mine there. Want to read it?"

"Yeah, let's see it."

Ed read the following:

"Foremen Leaving Department.

"Foremen will leave their departments as little as possible. If an office department desires information that requires a personal interview, it is expected that the party wanting it will visit the shop. If, on the contrary, the foreman needs information that requires a conference, he will go to the office. In cases where conformity to this rule would involve the carrying of a mass of drawings or records into the shop, it will not apply. Neither does it apply to times when foremen are called by an executive or for conference.

"Its main object is to have the foremen available to the men in his department as much of the time as possible. It is not intended as a criticism. "Signed: G. B. Williams, General Superintendent."

"Well, Ed, what do you think of that rule?"

"Rule? That isn't a rule, it's an insult. Why not furnish a chain with each desk, or surround it with bars? By darn, I'm done."

"Done, my eye. Why don't you use your bean for thinking once in a while, instead of something to keep your ears apart. Williams had a good reason for issuing it. I put up a kick at trotting over to the office at the call of some clerk who is too lazy to come over to the shop, and you told me yourself you put up a howl only last week. This notice is Williams' way of taking care of it."

"But why should the way of putting it be so offensive? It isn't the foreman's fault."

"No, Ed, it isn't. But do you think that Williams, or any one else, could write a restrictive order that wouldn't ruffle someone's tender feelings? As a matter of fact, that's a darn diplomatic notice."

"Yeah, just what is your idea of diplomacy, fella?"

"Well, this rule is an example. It serves notice on the office to run its own errands without implying that they don't do it now. At the same time it shows any foreman that needs such a reminder, that his absence from his department is noticed."

"Williams has no authority over those office departments; he can't post the notice there, where it's wanted, so it only puts it up to the foreman to refuse and cause hard feelings."

"He doesn't need to post it. It says on it 'Not to be posted.' A copy will go to each head, and as they are all good sports they'll see the point and issue orders."

How can we lessen the number of calls upon a foreman's time and leave him free of unnecessary interruptions so that his fullest attention can be centered on his men and his work? Would such a ruling serve this purpose or is there some better way?

Discussion of Former Topics

Signing Off

It seems that business is always looking for a means to fix responsibility and eliminate "passing the buck." If the placing of an O. K. or initials soon becomes a mere routine, how then will a differently colored pencil or the full name under the O. K. eliminate the trouble?

The fallacy is not, in most cases, in the system itself but more likely in the enforcement of the system. In solving the problem of enforcement, the problem of stopping carelessness will also be solved. When a definite number of errors is made and the cause traced to the laxity of the responsible individual, a temporary demotion, a cut in salary, or a curtailing of shop privileges will probably put an end to the offender's errors. In fact, it will be found that, with some means of system enforcement, it will seldom be necessary to bring pressure to bear to maintain a smooth running, systematic shop.

—Roy E. Peterson,
E. H. Hotchkiss Company.

The Deadline

Some of us are inclined to forget that equality, in our scheme of life, simply means that after birth we are privileged equally to become unequal as fast as we can do so.

There is no equality in the idea of giving day-rate men the same privileges as salaried overhead help. The office worker shares in no piecework or bonus production pay. The shopman does. The office man is often called on to work overtime without pay. The shopman must have exact pay for all his time, and usually a premium for overtime.

The real facts are that the salaried man is trained to think in intangibles and ideals as well as facts. He is more loyal, will stick longer in case of a strike, and is in many ways more sympathetic with the management's ideals. He is trained to give out a little service occasionally without thinking necessarily of a direct return.

On the other hand the shopman, while just as important in the scheme of things, has had a different training. He deals in facts only. An extra hour means an extra hour's pay. He demands his remuneration at once directly. His viewpoint is best expressed by the words of the late Samuel Gompers: "Put your welfare in the pay envelopes, and we'll take your goodwill for granted."

A vacation is only justice for the salaried man. He has earned it. I believe, too, that the best grade of shopmen—men who can appreciate that a salary carries disadvantages as well as advantages, should be put on a permanent salary, and given a vacation like salaried men.

—James K. Matter.

Rules is Rules

The instructions issued applying to a previous rule do not nullify or weaken it, but emphasize the need for discretion as to its enforcement. When rules are issued there is no desire to handicap anyone, or to hinder work. The root idea is to stop some abuse. Laws are made more for the guilty than for the innocent; therefore, it is assumed that officials should use discretion about them.

Unfortunately, this is just how the difficulty arises, for many adopt the attitude that "a rule is a rule" and must not be broken. Many officials are unbending as cast iron and not only adhere to an order, but magnify it, to the inconvenience of every one. Any illiterate man can do as he is told, but it requires wisdom to manifest discretion about it. One must not consider himself ill-treated when snubbed for failure to show reasonable judgment. Years ago an order was issued that "no workman must enter another shop, except with a written order from his foreman, under penalty of dismissal." This would appear to handicap those whose business took them all over the factory, but it was not intended to do so, but rather to stop unnecessary trespassing and gossiping. Similar instances could be related, where to obey a rule would show lack of common sense, or to enforce it would show poor judgment. Old soldiers, or policemen, when given positions in a factory, generally spoil themselves in this respect, for they have been taught to obey, not to reason.

—Wm. Bryce, *Sheffield, England.*

Advice, Gratis

Were I starting life anew, I would take the advice mainly of people between the ages of 30 and 50. Between these ages a man probably thinks with less narrowness than before or after. I would also want the advice of people who had had a wider experience than just that of their own state.

Unfortunately, people with real experience are usually retiring and rarely volunteer advice, while the man who has never been outside of his own little town, and scarcely out of the shadow of the shop of his boyhood, is ever seeking ears, willing or unwilling, into which he can pour his recommendations.

The home town guard will advise you to quit your job and go West, or some other quarter of the compass. They themselves are only waiting for a certain moment, when all will be clear and they will come and join you, but things never clear enough for them to leave. They sometimes vary by advising you to leave and start on your own account, but whatever it is, you do the moving and they stay on. —Sidney Beaujon.

Slowing Down

If there has been a general slackening of output, the onus for it surely rests on inefficient rate fixing. Piece work never was, nor should be, based merely on day-rate production, but on a careful analysis of the various motions, speeds and feeds required to produce any given item.

We all know the wiseacre who looks at a job, and with a knowing air says, "I'll give you so much for that," as though he had some sort of inspired knowledge that enabled him to size up any job on sight. I

once worked in a shop where a cost clerk used to come around when you were doing a job and attempt to size your work up in this way. One can easily guess the result. Such methods may pass for a time, but eventually they result either in acute discontent or in the condition of things visualized in the problem before us.

Usually if a foreman doesn't get out production, the powers that be soon see that he makes room for someone who can.

Lastly I don't think we need worry about what interlopers think of workers generally. Be they professors or of similar kidney, their opinions only carry weight when backed up by practical experience over a much longer period than that indicated. Far from there being a general slackening of output, the position, on a more careful analysis, would be found to be distinctly the reverse. —T. H. HARGRAVE, *Lancashire, England.*

Taking a Gamble

The question of what should be done with a man who unconsciously applies for a superior post in the firm by which he is already employed depends entirely upon the man himself.

No matter what the circumstances may be, the management should grant an interview. It is the revelations of this interview, together with the man's record, that should decide upon the course of action to be taken, for it is an easy matter to obtain an idea of the man's value by allowing him to talk a little.

Should he prove to be of the bragging type, with a none too good record, the inevitable course is to discharge him. He would never successfully fill the post and would cause trouble back with the operators. If the interview reveals a man of the useful, steady type, and a conscienceous worker, but with insufficient brilliance and originality to fill the post he covets, to discharge him would only be losing a valuable man, while on the other hand a sympathetic conversation from the management might make the applicant content with his lot, and prevent him applying for similar posts outside his firm.

The last possible outcome of the interview is that a man comes forward with a good record, and an evident adaptability for the post in question. In this case no time should be lost in giving him the post, as no matter what department is concerned, his intimate knowledge of actual working conditions will make him far more competent to handle the job than any stranger.

—RONALD L. TANBY, *Notts, England.*

Service De Luxe

Opening the tool cribs early and keeping them open fifteen minutes longer at night is a good idea. If the men are on piece work, they will be glad of the opportunity to get their tools early.

You find among a group of men some who are in the habit of getting to work early because of train schedules, or because of a desire to be on time. These men will be glad to step up to the tool room and secure their tools, then sit down and have a smoke.

I have often wondered at the time spent waiting, ten men deep, in front of a tool crib window at starting time while the fellow at the window stands and argues about some tool.

At quitting time, nearly the same conditions are found. Some of the men's trains go later and they have no reasons to hurry out; others will have reason to be in a hurry. The ones in a hurry will get their tools turned in by quitting time, thus eliminating confusion at the tool crib.

Some job may just take those few extra minutes to finish, which would save the mechanic the trouble of turning in a lot of tools and having to take them out for only a few minutes the next morning.

—V. CONRAD WATSON, *Master Mechanic, Franklin Pottery.*

Who Pays the Bills?

About the only way the company has of keeping account of tools is through the checking system. There must be some method or tools would disappear. The men who borrow tools from the tool crib are without doubt responsible for their safe return or at least the return of the broken parts, in the event that they are broken.

If any of the tools are not returned, the company has the right to exact payment from the man against whom they are charged. Yet it does not seem fair to charge an old employee for tools that have apparently been lost or stolen. True, he should take care of the tools as if they were his own, but if the tools belong to the company he cannot refuse to loan them to another man in the company's employ. He should demand the man's check before letting him have the tool, but an individual cannot always handle such matters in the same way as does the company. He expects the men with whom he works to trust him and he must in turn trust them.

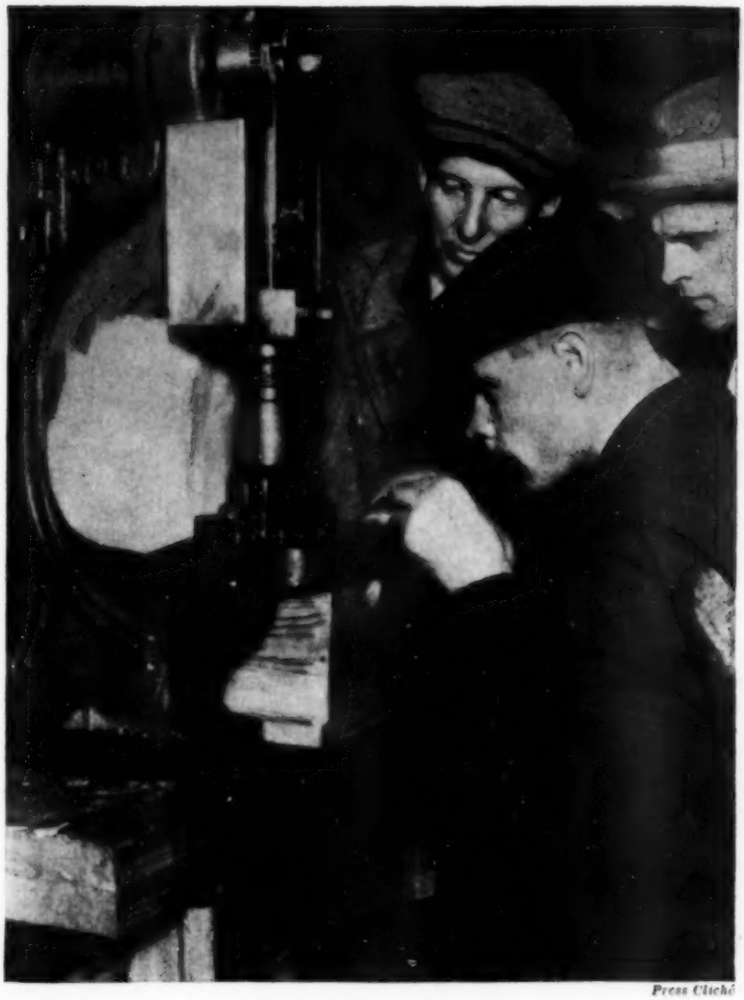
—W. J. OWENS.

Signing Off

The five precautions mentioned are necessary in any orderly and well managed shop. Because it is somebody else's money, we have an increased rather than a lessened obligation in how we spend it, for purchases, time allowances, stores requisitions, quitting slips and starting rates. The foreman who has had close control of his expenses looms up during a curtailing in spending and is remembered when salary increases and promotions are in order.

One illustration of careless initialing occurred when we took over the management of a tool plant. The worker wrote his own piece-work sheet; the foreman initialing fifty to a hundred sheets with only the top one visible. On checking we found the same operation on a single lot was paid for as many as three times. While the foremen were horrified when shown, they admitted their laxness. Signing or initialing anything and everything was the weak spot worked on by their men.

Bothered? One of the most important activities of any foreman is to keep his expenses under control. The foreman not "tooled-up" to handle his paper work efficiently is apt to bump smack into some unpleasant news when the accounting department issues the monthly expense distribution sheets. If he tries to dig up the why of such large expenses, he will be surprised to see the money he has spent by a mere stroke of a pencil. Knowing your job means to understand and control the paper work just as well as men, machines and shop methods. —E. E. GAGNON, *Mechanical Superintendent, Raybestos-Manhattan Company.*



Press Cliché

"No American business man can afford to ignore what is going on there . . . . . " Mr. Carmody has just returned from a three months' Survey of Soviet Russia. Every reader, executive or operative, will be interested in checking his findings against those of Mr. Polakov

Men and Machines in Russia

JOHN M. CARMODY
Editor, Factory & Industrial Management

SO MUCH has been printed and said about the Soviet Five-Year Plan that its aim and scope is familiar to all of us. What I went to Russia to see was how far accomplishment measured up to the plan and whether the wheels of the huge industrial machine they are starting up were running smoothly or not. My trip took me from Negerole on the Polish border through Sverdlovsk to Magnetogorsk in Siberia, and from Leningrad on the north to Baku on the Caspian Sea and Batum on the Black Sea, including five days on the Volga River. A visit to the Rostov agricultural implement factory and the nearby farms, Gigant and Verblud, embracing together nearly 500,000 acres, gave an opportunity to study the tie-up of agriculture and industry. This program meant 10,000 miles of travel in eight weeks.

Before going to Russia scores of people had told me that I could see only what the Russians wanted to show me. This did not prove to be the case. I laid out my own itinerary and never advised any director in advance of my call. In my pocket was a blanket letter of introduction, dictated by myself and signed by a high official of the Supreme Economic Council. Many times I stumbled on plants I had not heard anything about. Everywhere I found uniform courtesy and interest in America and American methods. I came away impressed with the feeling that no American business man can afford to ignore what is going on there.

Nobody in Russia believes that complete industrialization will be achieved in five years; everybody realizes that it will require several five-year plans, but in the meantime a start has been made. Millions of roubles are being spent to build new plants of every conceivable sort. There is a terrific urge to get things done all over Russia, and everywhere people are in conference with this program or that project so that one gets the impression of feverish activity.

In this first stage of industrialization, most of the effort is being directed toward coordinating the activities of industry and agriculture. That accounts for the fact

that the biggest emphasis is placed on the development of agricultural machinery. Plants for making such equipment are springing up all over the country, and are located from the political rather than the industrial point of view. One of the largest agricultural implement plants, for example, is in Rostov, right at the base of the Ukraine, the richest wheat land in Russia, and they are adding a combine plant. The first large tractor plant was built in Stalingrad.

The psychology is that the farmers can actually see the combines and tractors come out of the plant. It is well recognized that there must be close coordination between the peasants and the industrial workers if the revolution is to continue to be successful. In reality what the city workers promised the peasants for giving up their land and their old methods of farming were machines that will produce large quantities of grain with small amounts of labor.

Political Theory Vs. Economics

This whole plan was conceived by dreamers—men whose lives had been devoted to the study of revolutionary philosophy—party men, theoreticians. These men had the top places in the early days of the five-year program, but as they began to buy machinery and put it into place and to compare accomplishments with the plan they got a jolt. It dawned on a good many people that while theory is a fine thing and philosophy important to the revolution, the realities of economics must come from some one with practical industrial experience who must have something to say in the guiding of this work. This realization was responsible for Stalin's recent statement about recognizing individual efficiency and listening to the advice of outside engineers. Unquestionably, the greatest need in Russia today is intelligent industrial management and the elimination of fear on the part of managers and engineers that they will pay heavy penalties for making mistakes.

The experiences at the Stalingrad tractor plant are indicative of the new attitude. This was the first of the tractor plants to be put into operation, and a record was made in the erection of the building. A Russian commission came to the United States and hired John Calder, the man who put up the Ford plant at Dearborn. Without having another English-speaking person on the job, Calder erected the steel of the Stalingrad plant three months in advance of schedule. The news of this deed went through Russia like an electric spark. "See what we did in Stalingrad," they said. "We will finish the plan in two years." Calder became one of the best-known figures in Russia.

Then they brought in machinery, a great part of it from the United States, and brought in some 430 men from Detroit, including foremen, assistant foremen, job setters and diemakers, and mixed them with Russian peasants. The result was a great mess. A plant designed to turn out one tractor every eleven minutes, 154 daily, limply and lamely began to turn out a lot of junk. The machines were abused and got out of order. Particularly where fine adjustments were required, together with exact timing, they couldn't seem to coordinate the controls. With supreme confidence the worker stepped up to the machine and blithely pulled this lever and that until something jammed. At once they blamed the machine design. For one thing, the early shipments of American machine tools had the operating instructions in English on nameplates at the controls, and this was no help. More recent shipments have the instructions in Russian. Another source of difficulty was failure to lubricate.

Lack of familiarity with cutting tools was one of the chief causes of underproduction. With no past experience to judge the proper feeds, speeds and depth of cut, the worker often broke the tool or part of the machine before he realized his mistake. Foremen were not of much help in this direction as they were equally inexperienced.

Without proper planning, there were material shortages to add to the confusion, or else there was an overabundance of parts. This latter situation was aggravated by childish surrender to the easiest job. Instead of concentrating on the difficult tasks, they enthusiastically went ahead with work on machines with which they were having no trouble. As a result, some parts are in sufficient quantity to take care of assemblies for the next two years.

Presently, they were getting six, seven or eight tractors, just groping along, and it was some months before they got up to 15 or 16 per day. About this time, the leading newspaper in Moscow, *Pravda*, began to print production figures and openly criticize the management. Large charts on the front page showed what the daily production was, and if the figures were worse than the day before, the paper gave them a terrible roasting. No one is ever spared in Russian newspapers.

Then the Shake-up

Naturally, there was confusion, but as a result of this newspaper attack and a study of cost figures that followed, the plant did begin to show improvement. There was a shake-up. Some of the Americans were sent home because they weren't efficient, and others went because they didn't want to stay. The Russians began to take better care of the machines, and a maintenance depart-

Erecting upright drill presses in the machine tool department of a Leningrad plant during February of this year

ment was organized under the direction of a competent American. Within three months, production went up to 40 and then approximately 50 tractors a day. Everything is not entirely satisfactory yet, but a considerable improvement is shown over earlier conditions.

This was the best lesson that Russia could possibly have had. If the plant had started out as they thought it would, producing anywhere near the schedule for which it was planned, they would have been ruined. They would have gotten the mistaken notion that all they needed to do was to buy the last word in American production machinery, press a button and operate these machines with peasant boys and girls. Now they realize that this is not possible. Hundreds of Russian engineers have been sent to Stalingrad to study that situation. The experience of this plant is beginning to penetrate all through Russian industry. The Russians learned a great deal more from Stalingrad than they possibly could have without that experience. It is characteristic of Russian engineers to blame the machinery and say the design is not right, but in this instance their criticism of the machinery didn't stick because the same equipment in our country was turning out much greater production.

Russian engineers visiting America saw our plants running smoothly and thought that machinery alone did it. They didn't appreciate the part played by skilled handling of the machinery and skillful management. Stalin has recognized this situation by giving greater responsibility to engineers.

Skill of the workers is being developed by training courses all over the country. In Moscow, for example, they have a training school where operators are trained to work on machines. Theoretically, the course is very scientific. Curiously, however, at this particular school the workers are not trained at a single machine that is being used in any modern factory today.

Shop Schools

In every plant there is a school in which they train boys and girls. They work part time there and part time in the shops. You cannot visit a single plant in Russia without seeing a group of school children going through the plant to see what is being made. In the new Amo truck plant, for example, which was just opened, a group of school children witnessed the first operation of a steam hammer. Everyone had a pencil and pad, making notes about the operation.

Hence, in pushing the Five-Year Plan the Russians are making some endeavor through their educational plants to get people ready for these new shops when they are completed. But they can't get workers ready as fast as they can build the plants. It is physically impossible to take green people who have never seen machinery of any kind and expect them within two or three months to be efficient operators of complicated machinery built out of 50 years' of experience in advanced industrial countries. During the process of building they will make a great many mistakes; they will spoil a great deal of material, but gradually they will learn as they have learned in older industries where hand methods prevail.

This means that in the average industrial plant there are two to six workers turning out the same production that a single worker would turn out in a well-managed American plant. For political reasons and for reasons of education, it is important that everybody be kept at work, even though there are three to four times as many people on the job as there would be in this country.

American business men ought to give more serious consideration to Russia than they have been giving. We are already in business in Russia. There are hundreds of millions of dollars worth of American equipment all over Russia. We have extended a terrific amount of credit. They want more credit; they want longer credit. They will probably get it. They play one nation against another and know how to take advantage of our economic depression as well as those of Germany and other nations. They are much keener psychologists, much keener bargainers on the whole than are our business men.

"Org Metal"

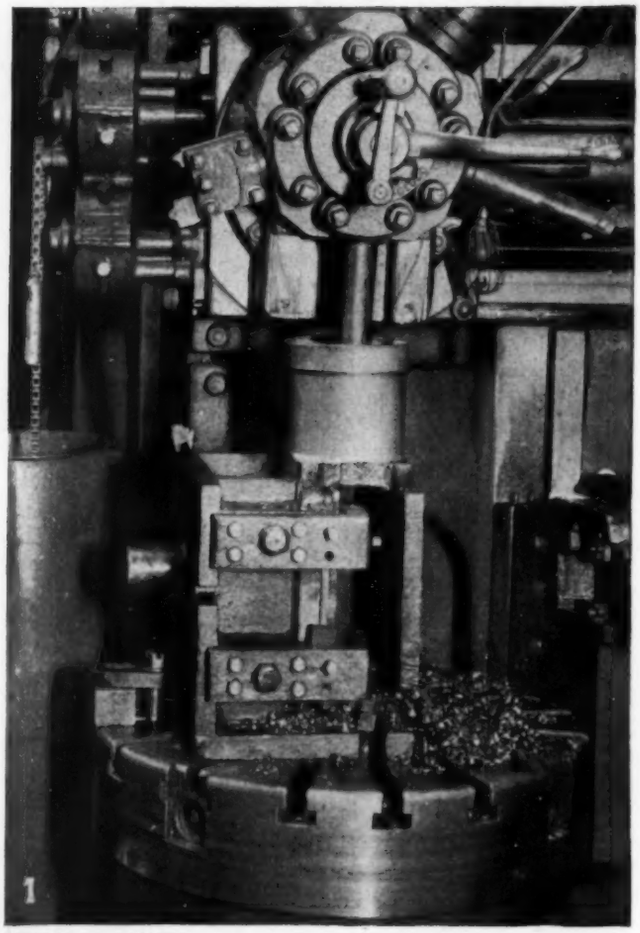
Two years ago American machine tools predominated in purchases from abroad; today Germany machinery appears to have the preference. For one thing, American manufacturers are not making the most of marketing opportunities. They don't appreciate, for example, the facilities of "Org Metal," nor do they cooperate with it. Yet Org Metal, besides being a permanent exhibit where machines are demonstrated and tested, is the meeting place of engineers and technical directors from all over Russia. Instead of being a dull showroom with the quiet of a library, it is a beehive of activity with workmen busily experimenting or demonstrating equipment. It also combines a training school for instructors and a testing laboratory for tools and cutting materials.

So much for the present. What is likely to happen at the end of the five years is that they will have completed the construction of a great many of these industrial enterprises and some of them will be in operation. Production won't be large, but the plants will be going. Meantime those Russians who understand the situation and who know mass psychology so well will have prepared the minds of a number of people for a second five-year plan, which is already in good shape. This second plant will have some provision for consumer goods. We shall probably not live, however, to see the abandonment in Russia of the control over the amount of goods that any person can have.

Leningrad women workers learning to mill spades for turbines at the turbine shop of the "Krasny Putilovetz" plant. It is expected that no fewer than 1,600,000 women will be engaged in various industries in 1931

Crossheads and Pedestal Binders

Photographs by courtesy of
Norfolk and Western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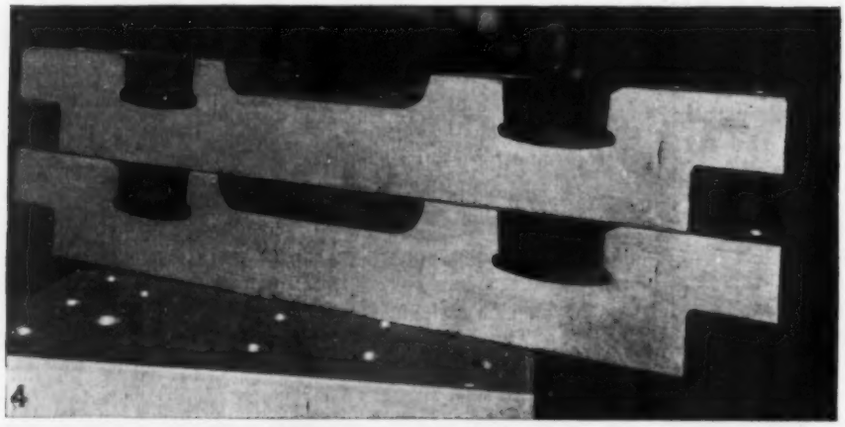
ALTHOUGH no railroad shop can hope for large scale production except on a comparatively few small items, fixtures can be used in many places. When designed for ease of handling and with a view to economical construction they not only save time but insure greater uniformity in the product. A good example of such a fixture is seen in Figs. 1, 2 and 3. It is used for turning, boring and reaming the piston rod end of a crosshead and for boring and reaming the taper hole for the crosshead pin, at right angles to it. The fixture has two guide pins projecting at right angles to each other and each in line with the holes to be bored. These pins enter a hole in the center of the work table and automatically locate the crosshead in line with the tools in the turret above.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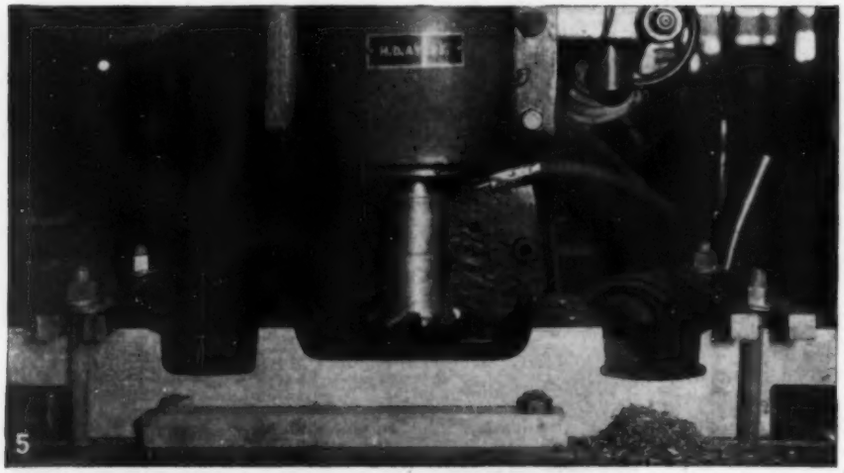
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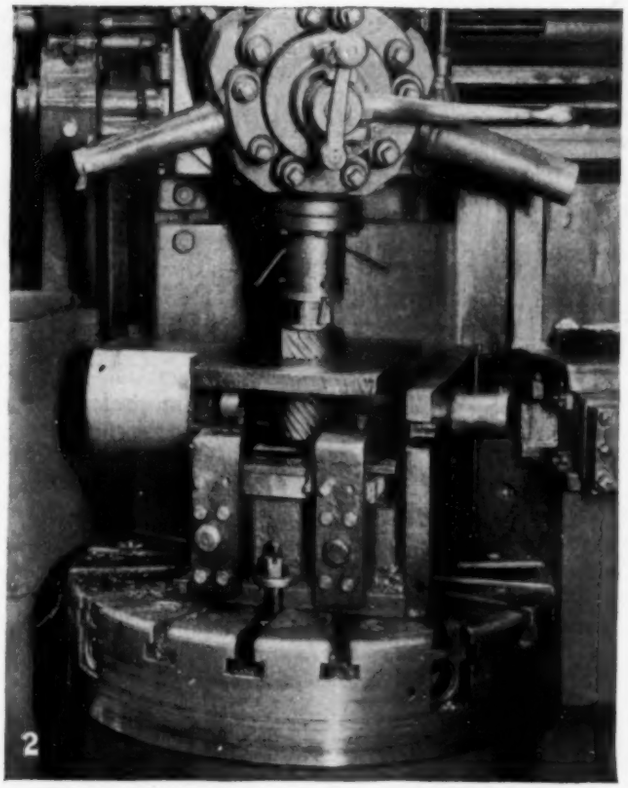
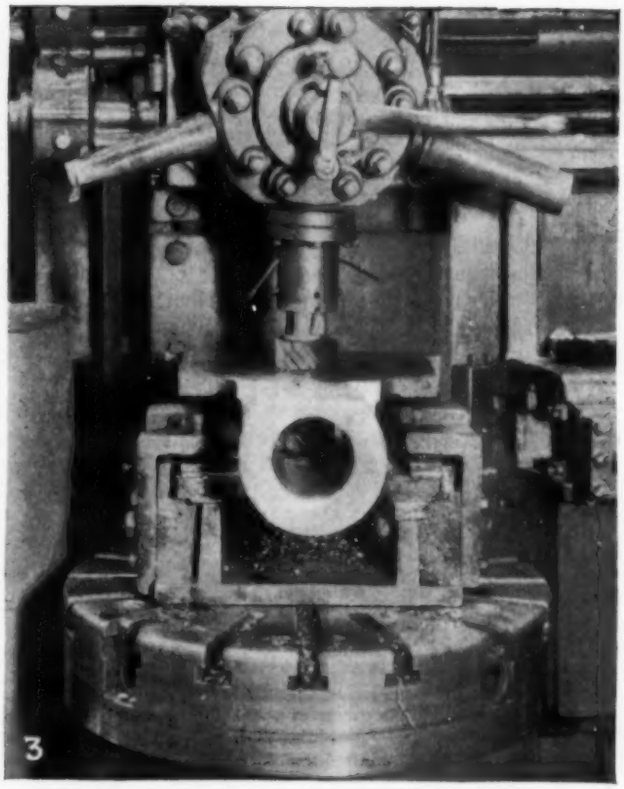
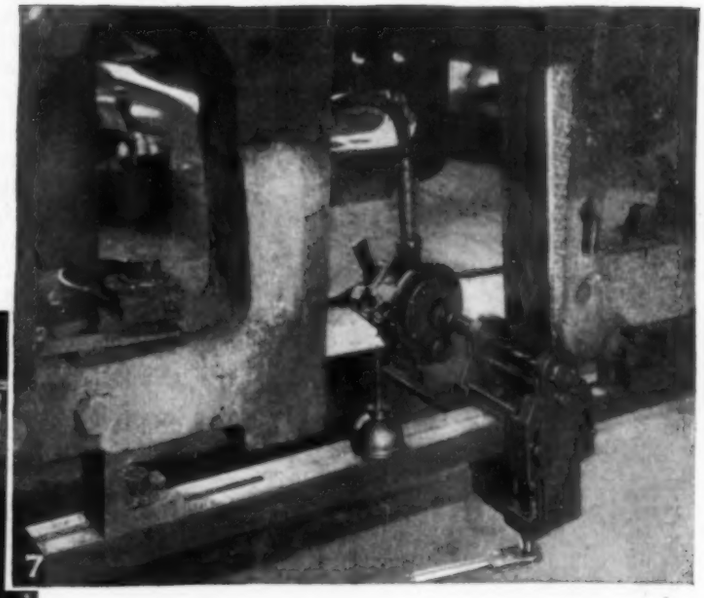
After turning the outside and boring the taper hole for the piston rod, the fixture is turned to the position in Fig. 2 while the crosshead pin hole is bored to the right taper and reamed as shown. While in this position the side is surfaced by the sidehead. In Fig. 3 the table is turned to show its construction more clearly and to show also the way in which the work is held.

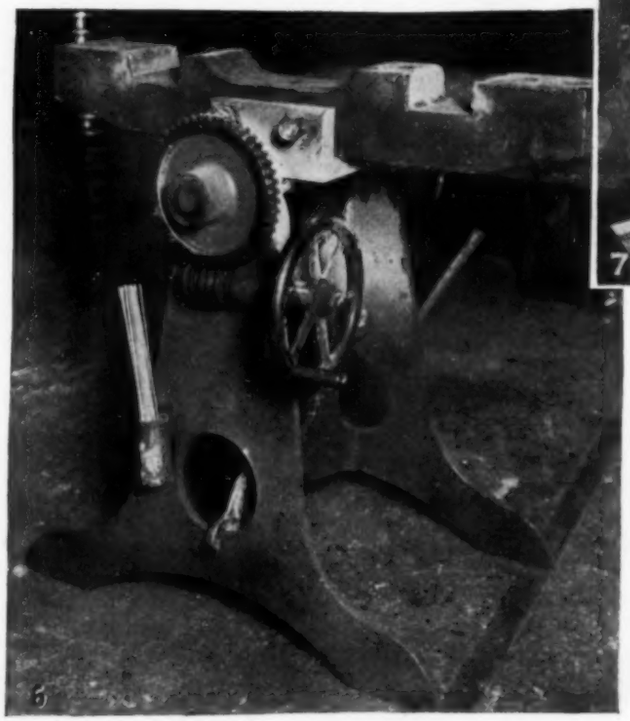
A special Bullard machine is used in turning crown brasses. This machine is designed for high speed; it will handle even the largest brass. Special care is given to the oil grooves in crown brasses. A Lehmen oil groover is used. Cast grooves have given way to clean-cut channels that are deeper than was formerly thought necessary. The James crown brass, which is tapered and held in place by a long tapered wedge, is being used to some extent. Bushings for both cylinders and valves are also machined on sidehead boring mills, using extra heavy boring bars for the inside.





A new design of pedestal binder has been worked out as shown in Fig. 4. The object of this design is to prevent cracks from starting in the corners. Undercutting the corners also prevents the ends of the pedestal or pedestal toe from wearing a shoulder in the binder and making it difficult to secure a good bearing fit. These undercuts are milled with the special form cutter illustrated in Fig. 5. After planing, the binder is put on a vertical miller and finished with the cutter by feeding the saddle so as to give the undercuts.





When wear occurs in either pedestals or binders it is remedied by building up with arc welding. In the case of binders, the welding stand in Fig. 6 is used. The photograph shows an old type binder in place. The work can be swung into any convenient position.

After building up, the frame pedestal faces are machined in position by the portable machine shown in Fig. 7. The supporting bar is bolted on in place of the binder and carries the milling head. The travel of the helical milling cutter can be set to any angle desired, the feed slide being easily adjustable. As is quite common in railway shop practice, an air motor is used to drive the pedestal leg milling machine.

NEW BOOKS . . . . . .

THE NEMESIS OF AMERICAN BUSINESS.—*By Stuart Chase. 191 pages, 5⅛x7½ in. Clothboard binding. Published by the Macmillan Co., 60 Fifth Ave., New York, N. Y. Price $2.00.*

A vivid and convincing picture of this nation's economic plight is painted by a master craftsman. The author reduces our dilemma to its elements—here our gains and here our losses resulting from the establishment of an intricate civilization. And from many angles, the losses overshadow the gains.

Sometimes depressing, this volume is not one of unmitigated gloom. Our social and industrial set-up with its many faults is not wholly futile. The good in it is to be prized; the bad is not essential to its proper functioning but exists because of our failure to carry the advance along a solid front. We have progressed in the many phases of manufacture, but in finance and distribution we have lagged. "The engineer is a century ahead of the banker." We are equipped to produce more than our present formula permits us to buy back. In fact, some industries, such as the manufacture of shoes, have expanded to a degree where even adequate purchasing power would not absorb their output.

A simple Mexican village, isolated and self-contained, does not face our Nemesis—unemployment. In so primitive a community the opportunity for work is practically limitless. People are close to the results of their efforts. They are free from the complex mechanism that keeps apart factories ready to operate and hands willing to work. True, we would not be happy in the same surroundings. We demand that which we call our higher standard of living. But even this attainment, by which we justify our mechanized civilization, is compromised needlessly. Towering piles of junk disfigure our cities, refuse pollutes our rivers, the slum has extended to the countryside. We hide our views with eyesores, assail our ears with increasing din, and fill the air with dirt and gases. Surely our much-wanted living standard falls far short of providing a Utopian existence.

But perhaps an even greater sacrifice to the altar of mass production and high pressure salesmanship lies within ourselves. Our pioneer forebears, self-reliant, outspoken, and ready to fight for their convictions, have given way to a nation of yes men. Today personal integrity is a luxury, too expensive for all but a few. We are not willing to give in exchange our jobs, our friends, our conventional niches, or the attainment of that much-prized goal, the amassing of wealth.

On these and other matters, such as the problem of the older man in industry, hindered rather than helped by the rise of pensions and group insurance, the author discourses. We may not always agree with Mr. Chase. We may suspect that more than once he takes recourse to exaggeration to vivify his startling panorama, but we cannot help but admire the workmanlike way in which he lays the incongruities of our own making at our feet. The American business man has been accused of closing his eyes to those things he does not wish to see. If this volume will aid in removing his blindfold, so he will face the defects in our social structure with the energy applied to our technical problems, it will have afforded a real contribution toward making this world more livable.

APPLIED KINEMATICS—*By J. Harland Billings, B.A.Sc., S.M., professor of mechanical engineering, Drexel Institute. 173 pages, 6x9 in. Indexed. 154 illustrations. Problems. Clothboard covers. Published by the D. Van Nostrand Company, Inc., 250 Fourth Ave., New York, N. Y. Price $2.50.*

Simple, lucid explanations make the subject of machine design, and particularly the design of connecting members, easily understood in this text. Extensive use of graphical methods and profuse illustration of up-to-date types of machinery aid the student in attaining a grasp of the subject. Consistent with the modern trend toward constantly higher speeds in machines, prominence has been given to the treatment of acceleration. General methods of solution have been used in preference to methods adapted to particular mechanisms. Those for acceleration in direct-contact mechanisms, as given in the chapter on cams, are new.

A wide variety of practical problems is included, and they are useful alike for the instructor who uses this book as a text and for the practical man who wishes to fix this subject more firmly in mind by applying it to specific problems. Applications chosen by the author to illustrate and anchor principles have been selected to assist the instructor in making the study of the subject an *applied* engineering course.

A PHILOSOPHY OF PRODUCTION—*A symposium edited by J. George Frederick. 259 pages, 5½x8 in. Clothboard covers. Published by the Business Bourse, 80 West 40th St., New York City. Price $4.00.*

Ten leaders, including Owen D. Young, Henry Ford, Walter S. Gifford, Charles F. Abbott, Myron Taylor, Bernard Baruch, Sir Philip Gibbs and Ernest Elmo Calkins, join in discussing aspects of production and the problems created by overproduction. Their opinions, if applied practically to industry today, might result in an entirely different concept of big business, "overproduction," "high-pressure selling," and fundamental reorganization of production methods. But until they are so applied, our economic difficulties will probably reappear with their accustomed regularity. Says Mr. Frederick in introducing the symposium, "Over-production is the green fruit of an aggressive civilization. To ripen it into full-fledged consumption with a good philosophy for its digestion is the work of a perfected civilization; and this is our subject."

The volume is extremely well handled, with few spots where the attention lags. In fact, this reviewer read every word, even though pages had to be cut, which is doubly unusual. Each man makes several explicit and pertinent points which bear thinking over many times. Says Owen D. Young, " . . Organized business has been quick to take the advantages of group action, but has been slow to assume group responsibilities." Says Henry Ford, "The task of industrial leadership is not to find jobs for as many men as possible, but to find *high-priced* (the italics are ours) jobs for as many men as possible, and the start has to be with a few high-priced men. For not otherwise can the low costs be attained which will increase consumption and make more high-priced jobs necessary. Production calls out man power; production is not called out by man power." And so through the volume, a significant and self-searching expression of what is in the minds of our business leaders.

Rights and Wrongs of Dimensioning

FRANCIS W. SHAW
Heywood, Lancashire, England

THE discussion on "Redimensioning for the Jig Borer" has developed into an expression of opinion on the merits and demerits of different methods of dimensioning in general. It has been suggested, not only for the jig borer, but for other machines, that all dimensions should start from convenient base-lines, for at least two reasons: prevention of accumulations of error and avoidance of the ill effect of backlash in feed screws, for the feed can always be in one direction longitudinally and one direction transversely.

The writer, having devoted not a little study to the problem of dimensioning, particularly with reference to tolerances, has but succeeded in convincing himself of one thing—that no single system is the best in all circumstances.

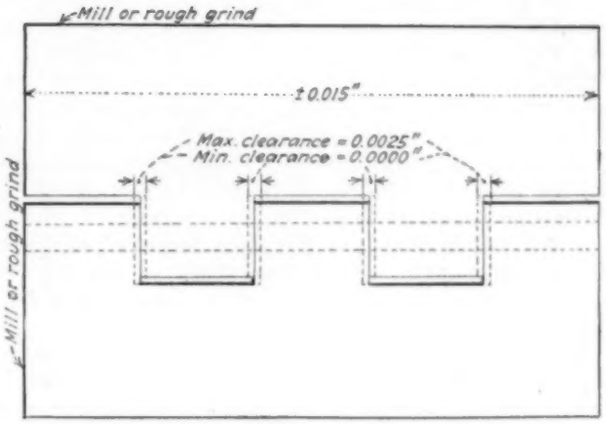
Though there is little room for doubt concerning the general convenience of the two-base-line method for the work of the jig borer, it is by no means certain that it will prove better than other methods for the vast majority of machine shop work. Indeed, there are many cases where it would be quite impractical.

However and by whomever dimensioning is done, attention must be paid to these factors: (1) the proper functioning of the parts when assembled; (2) quality of workmanship; (3) quantity—total, and in each batch; (4) equipment available; (5) production methods; (6) the gauging methods—all of them largely interdependent.

Factor 2, for instance, is to some extent dependent upon the meaning of "correct functioning." Two similar machines might be required for, or normally sold for, work of different qualities. One may, therefore, be of rougher build and less accurate than the other. If one's plant include grinding machines, it may pay to finish by grinding instead of spending additional time in machining to get the desired accuracy. Then, again, if selective assembly rather than absolute interchangeability is permissible, the dimensioning would be different. Different qualities of workmanship may appear in different parts of the same machine, demanding different production methods and, in turn, different gaging methods and different dimensioning.

It is surprising what an influence differences in dimensioning may have upon manufacturing cost. Hardly is it possible in some work to devote too much study to the subject, as the following personal experience should illustrate.

Formerly, all the elements of a somewhat intricate piece of mechanism were dimensioned in the old-fashioned way. Every dimension possible to insert was there, and every indication showing how the pieces fitted together was conspicuous by omission. As the parts, when assembled, had to line up with others already in the box, or with integral parts of the box, it was particularly difficult for the fitter, without elaborate testing devices, to know how to distribute his filing and scraping to get the desired fit to mating parts and to the box. Owing to faulty guesses, the completed mechanism was by no means as perfect as good functioning demanded.



How should these components be dimensioned with tolerances to insure the desired fit and to accord with production and gaging methods?

Because of the works' complaints and the assertion of the works' experts that the design was at fault, a shop-experienced designer was told to investigate the trouble, and, if possible, to eliminate it. He reported that the design was good, and that all the trouble came from poor dimensioning. The parts were merely re-dimensioned, with tolerances so specified that every desired fit was obtainable by ordinary machining processes, without, however, any increase in the cost of the machining, for the tolerances were at least as great as the variations which the machinists had permitted themselves to make.

The advantage of the change was reflected in the new cost of fitting and assembling as against the old, being but $1.25 as compared with $22.00. Fitting had, indeed, degenerated into mere assembling.

I do not recall how some of the problems, which are not unlike those of the hinges in the accompanying sketch, were solved, but we do know that they were not solved easily.

To dimension properly is not always easy, and when tolerances are to be given it demands more than usual intelligence not only on the part of the person who sets the tolerances but of everybody concerned with tool design and production. Gages present peculiar difficulties, as a little study of the sketch will reveal. How to set the gang of cutters so as to produce work within the tolerances is another problem.

I have selected this example as it affords an opportunity of explaining the difficulties experienced by cer-

tain "Black Country" (in Staffordshire, England) hinge makers when they were considering how to improve upon out-of-date methods.

Annually, in this district, are produced many millions of what are known as "butt" hinges. Those of the ordinary door variety range in length from 1½ in. to 6 in. For some reason, the makers, or their customers, insist on fits so perfect that, unblessed by experience in this trade, the ordinary production engineer would assert that they were unattainable without recourse to grinding. Yet most of them are produced with the poorest equipment and by machining alone, so that every male element fits every female element.

The general practice is to mill the female parts with straddle mills mounted upon an arbor running between the centers of a lathe. The blanks are secured in a fixture attached to the slide-rest. The feed is by hand at the cross-slide screw, and each blank is located endwise by a stop. The machine molded castings are uniform in size and true to shape. The tongues may exactly fit the mouths or they may be free to any extent not exceeding about 0.005 in. It is not essential that all tongues and mouths have the same degree of slackness, but at no point must the space between the butts of one element and those of the other element exceed the 0.005 in.

As far as the writer is aware, no one has yet succeeded in devising a system of dimensioning, nor a system for controlling the cutter setting, nor a satisfactory set of limit gages that will ensure perfection of fit wihout adding to the machining difficulties.

When one begins to study the problem of dimensioning any similar pair of fitting pieces, it is astonishing how difficulties crop up at every step. How would readers of the *American Machinist*, for instance, dimension the two elements so that at one extreme of the tolerances the maximum permissible clearance is obtained and at the other extreme the fit is perfect? Is it possible to devise a series of gages so that these perfect and most imperfect fits are obtainable? It appears they should be to give the maximum allowance for errors in workmanship. The writer has already faced the problem and, after much cogitation, failed to evolve as satisfactory a solution as that of leaving the business of getting the desired fits to the works, which, at the finish, adopted the scheme of the hinge maker.

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Beginning Next Week

If you will let your memory range back to war times, you will recall your difficulties with Ordnance specifications, blueprints, tolerances. During the intervening years the Ordnance Department has been anything but idle in formulating plans for overcoming them. Captain Soderholm has been persuaded to reveal these plans in a series of three articles. The first appears next week under the title, "A Yardstick for Ordnance Capacity."

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Chip Breaking—Old and New

Discussion

JAMES R. CORNELIUS
Works, England

I was interested in the discussion raised by T. Smith on the above subject (*AM*—Vol. 74, page 876). While we all agree that the difficulties of chip breaking should have been dealt with by the manufacturers of the new cutting alloys before they were definitely placed on the market, some of us realize the difficuties that this would have inflicted on those who have, in giving us these new tools, really done something great for the industry. To have waited until the difficulty was solved would have meant that these tools would have still reposed in the chests and strong rooms of Essen and New York.

To speak of a 12-in. shaft of nickel-chrome steel being turned down in a powerful lathe utilizing tungsten-carbide tools with a cut of ¾ in. deep and a feed of $\frac{1}{16}$ in., thereby reducing the diameter of the shaft from 12 in. to 10½ in., is only seeking trouble. The blue-hot swarf that is bound to stream from the tool is naturally a source of danger to both operator and machine, and such turnings should never be allowed. In fact, in a well organized shop they are not seen, not even where shafts of more than 36 in. diameter are being machined. Such turnings are the emblems of waste.

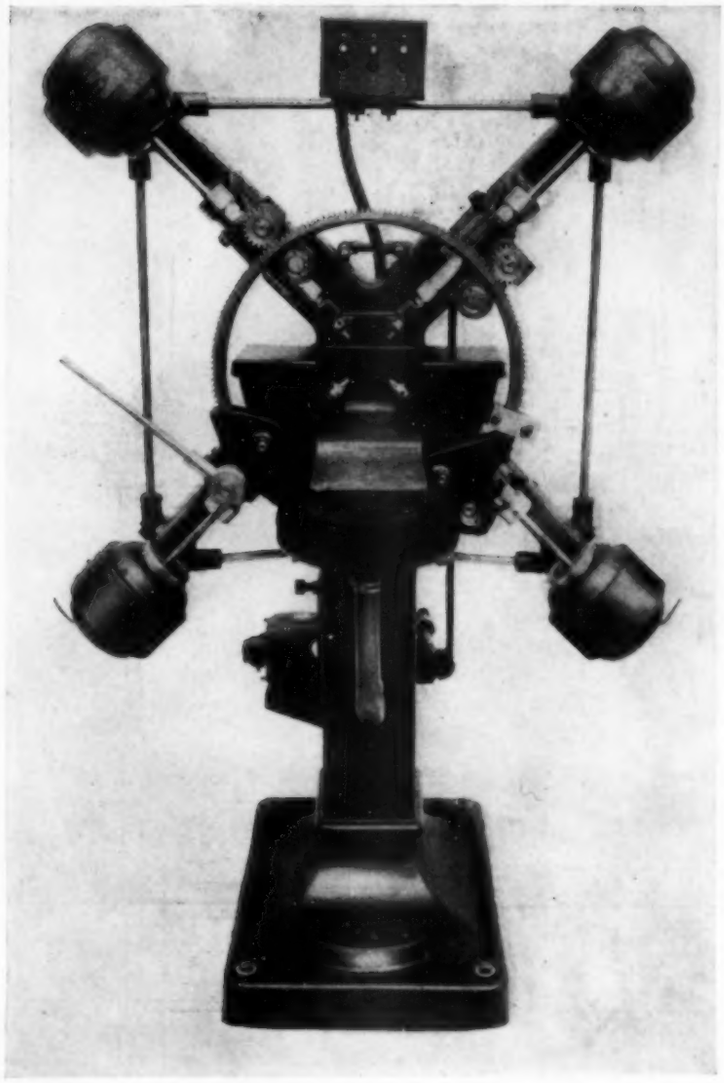
If we take the shaft spoken of, 12 in. diameter reduced to 10½ in., we have a dead waste of metal approximating 3½ lb. of high-quality steel per inch of cut. To this must be added the cost of the enormous power utilized in removing this metal.

It is a great thing, according to some manufacturers and operators, to be able to turn great chunks of metal from expensive forgings, to be able to tell the world that such and such a lathe can take an inch-deep cut at $\frac{1}{32}$ feed, that the driving motor has several hundred horsepower. But those who do are only telling the world how foolish they are. Nowadays the craze should be to take off as little metal as possible with as little expense as possible, as quickly and accurately as possible.

A demonstrator was recently sent to Manchester from Germany with a powerful lathe specially designed for cutting with the new alloys. He arrived with instructions to show what the machine was capable of. He seized the most awkward chunk of scrap iron that he saw in the yard, chucked it and in a few minutes, so to speak, he had made several hundredweight of real good, cast-iron foundry scrap by taking $\frac{1}{16}$ cuts as deep as the tool would permit. Blow holes didn't worry that lathe, and the shop foreman, with his lathe hands, stood looking on open mouthed. The manager was called in and the exhibition repeated.

"Hm!" said the manager, "it's just as well to know what the machine can do in case of necessity, but if we were to leave an inch on our forgings all round, simply because we've bought one of your lathes, we would soon be bankrupt. Our limits from foundry and forge are ⅜ in. on the radius over finished size for practically all round stuff. The first roughing cut leaves $\frac{3}{16}$ in. to ¼ in. for the finishing cut, allowing only about a ¼-in.-deep cut for roughing."

When all of our managers show as much ability to conduct their works on economical lines, there will remain no great difficulty in breaking chips.



Four-spindle drill with four built-in motors and built-on feed motor, all with push-button control. Housing, bearings, and shafts for the built-in motors were furnished by the tool builder

Motor Mountings

for Maximum Production, Minimum Maintenance

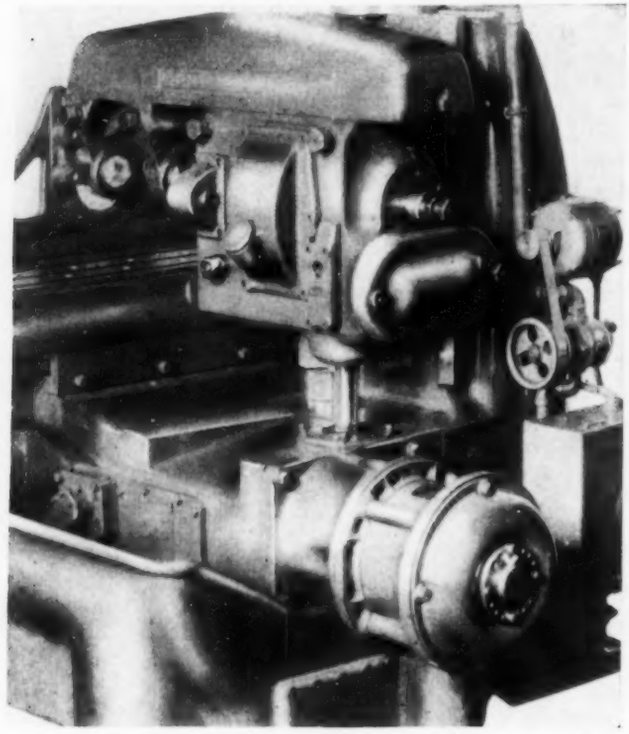
H. M. FRENCH
Industrial Engineering Department,
General Electric Company

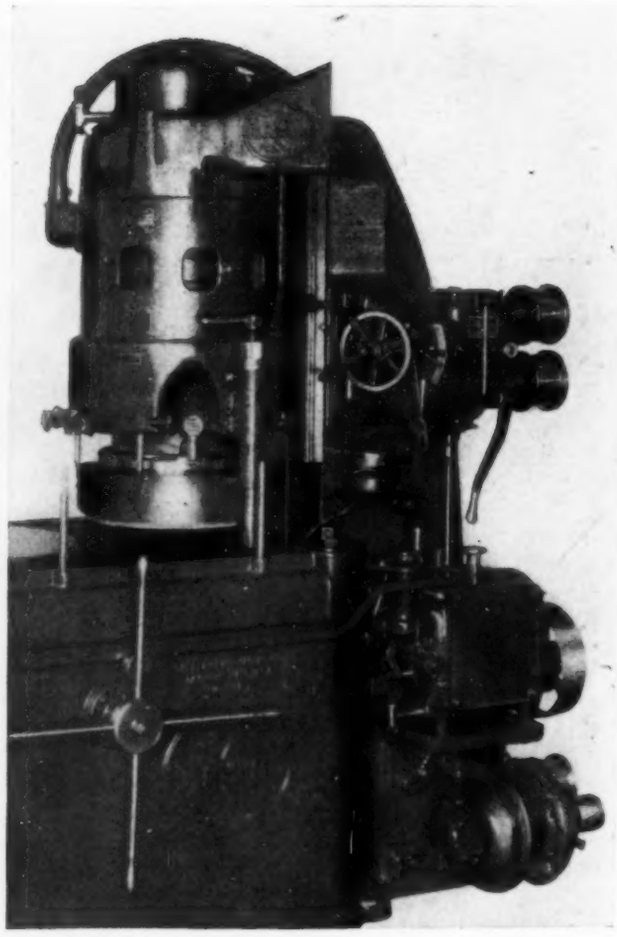
DURING the last few years, there has been a decided trend in motorizing machines toward "keeping the power in the wire to the last inch," or in other words reducing to a minimum both the distance and the amount of moving equipment between the motor and the driven machine or machine part. This tendency has resulted in unusual motor mountings, that have in themselves increased production directly or indirectly by releasing floor space which may be utilized for the installation of additional machines. It is the purpose of this article to describe the reasons for and advantages to be gained from these special motor mountings.

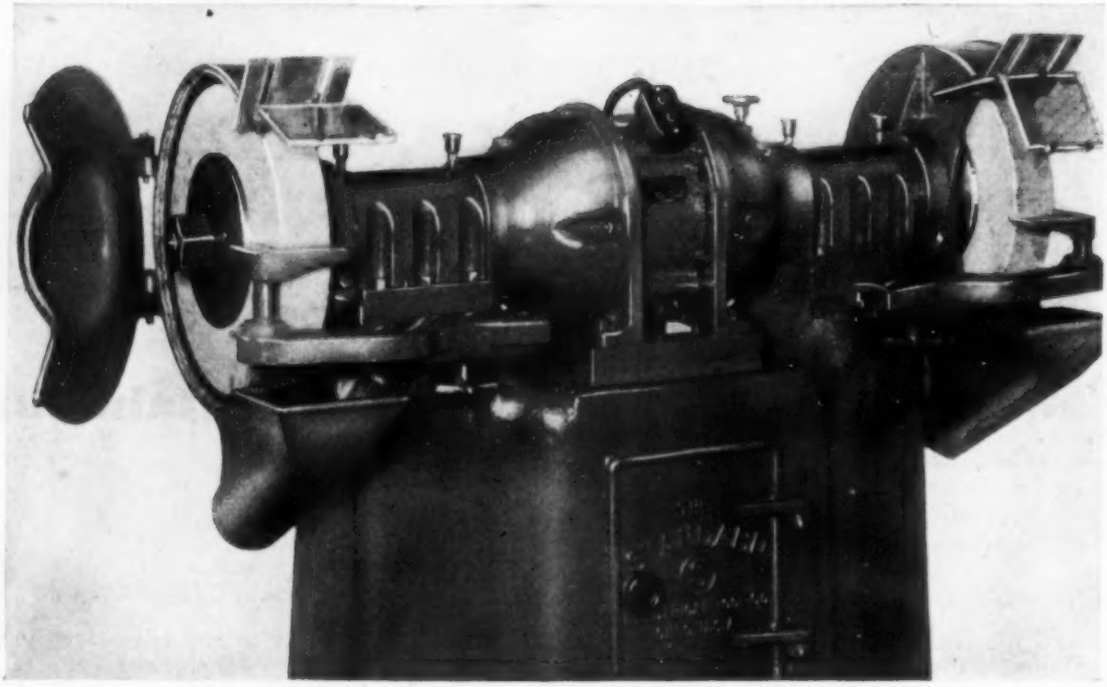
Everyone is familiar with the standard horizontal motor, mounted on the floor and direct-, belt-, chain-, or gear-connected to the machine which it drives. However, plant engineers and maintenance men are finding that this motor may be mounted directly on the machine, on the ceiling above it, or in the base of it, and another machine set up in the space formerly occupied by the motor. The effect, in this particular case at least, is to double

Right—Vertical surface grinder equipped with built-in vertical induction motor and side-mounted feed motor. The 25-hp. vertical motor is direct-connected

Below—Milling machine with built-in induction motor and magnetic switch. Mountings and motor bearings were furnished by machine builder. Cutting lubricant pump is driven by a separate motor



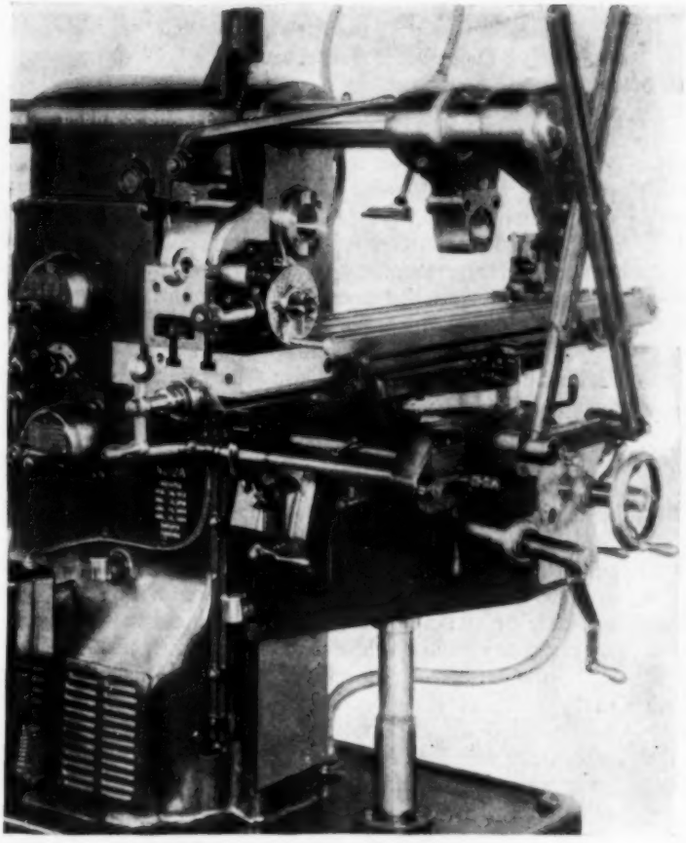


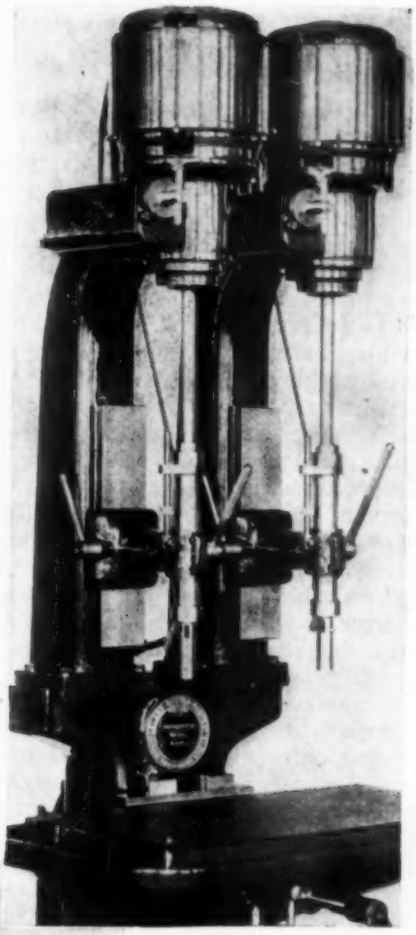


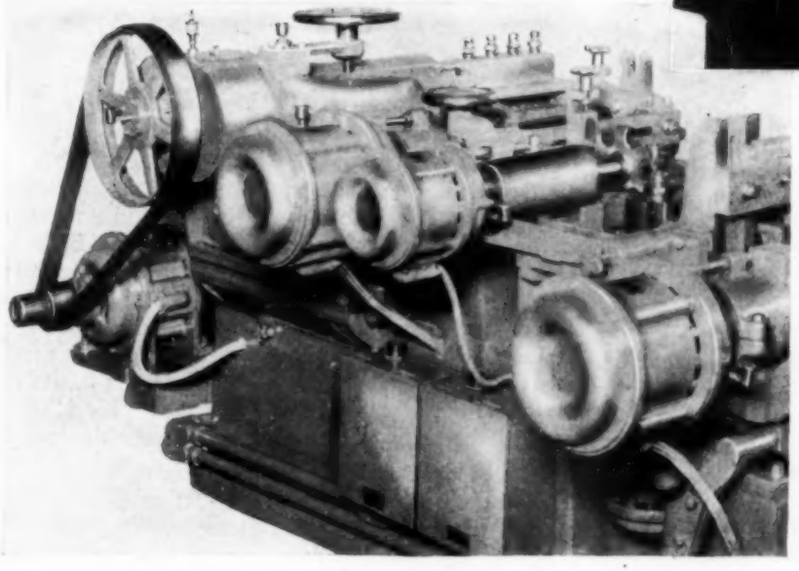
Standard heavy-duty ball bearing grinder equipped with built-in squirrel-cage motor. The control is mounted in the base. Only starter and rotor were furnished by the electrical manufacturer

production in the same floor space and to effect a comparable, and often superior, drive. In fact the machines themselves have been radically redesigned to take full advantage of close-coupled electric drive—the old line shaft and belt-driven machine converted to individual drive was only a temporary compromise.

The advantages of special motor mounting may be summarized thus: Decreased floor space required by individual machines; makes possible the installation of machines in hitherto inaccessible places; permits sub-







Left Above—Milling machine with motor built into base equipped with ventilating louvers. The magnetic switch and push-button station conform to the design of the machine and are conveniently located

Above—Two-spindle drill with built-in 4-speed vertical induction motors. At the left of each motor is a pole-changing switch, giving necessary feed changes to permit use of low-maintenance squirrel-cage motors for adjustable-speed service

Left—Woodwork-molding machine with four built-on motors and a normal feed motor. The built-on motors have overhung rotors and dummy end shields; frames are flange-mounted

stituting direct drive, with its attendant economies and advantages, for indirect drive; permits division of power for operations and using the type of motor best suited to each operation.

The subject of vertical motors may be sub-divided into general-purpose vertical motors and vertical built-in or built-on motors. Each kind of motor is especially advantageous for certain kinds of work. The general-purpose vertical motor finds general acceptance on drives for pumps, centrifugal extractors, laundry machines, agitators and pulverizers. This type of motor has both mechanical and electrical characteristics comparable with those of the normal horizontal motor. Purchasers are generally given a choice of several base mountings, which permits them to select the one best suited for the particular job at hand. Bearings are designed for varying amounts of thrust according to the application. Various degrees of motor protection are provided, ranging from top covers only to complete motor enclosure. Bearing lubrication is given special attention in design. It is the usual practice to have the top bearing carry the thrust load.

Vertical built-in or built-on motors are being used in quite large numbers by the wood-working and machine tool industries. This type of drive is compact, requires a minimum of maintenance and permits the use of as

many motors on the machine as there are shafts to be driven.

Built-In Motors

The built-in or built-on type motor constitutes a large proportion of the motor drives used on machine tools, wood-working machines and process machines. In the most extreme type of built-in motor, the electrical manufacturer furnishes a wound stator and a squirrel-cage rotor without housing, shaft, or bearings. The machinery builder provides a ventilating housing to hold the stator and mounts the rotor directly on a working shaft. These motors are built to the smallest possible diameter so that several motors may be mounted side by side, closely spaced. On wood-working machines and in a few other applications, the motors are required to run at very high speeds. Special high-frequency circuits are provided in these cases, thus avoiding speed-increasing gearing that would be required with normal-speed motors.

A common type of built-in or built-on motor has the rotor overhung on the machine shaft; the stator housing or frame is flanged at the machine end for mounting, and a "dummy" end shield without bearings closes the outer end. In some of the most modern machine tools the motor is not visible, as it is placed within the pedestal of the machine where it is protected and where it does not add to the space occupied by the machine. With control devices such as a magnetic starter and push button station that harmonize with the machine design, the machine presents a pleasing appearance. An old-time millwright would wonder how it would be driven.

Among the large overhung and built-on motors, the synchronous motor is the most popular because of its large air gap and its inherent adaptability to low speeds. Such motors are used on compressors, vacuum pumps, line shafts, and the like. The large slow-speed synchronous motors occupy little space along the shaft and are well suited for installation on a compressor shaft between two bearings. These motors to be overhung or mounted on the machine builder's shaft between bearings can be obtained with split hubs, completely split rotor or with split rotor and split stator for convenience in assembly.

Ceiling-Mounted Motors

Ceiling-mounted motors are used to some extent in lumber mills and in textile mills. They are used in lumber mills on band saws. A band mill consists primarily of two wheels mounted one above the other in a frame, over which runs the endless saw. This frame is mounted so that one wheel is above and the other below the floor. The bottom wheel is of heavy construction to obtain a large flywheel effect and is provided with the driving shaft. It will be readily seen that a direct-connected motor ceiling mounted in the room below provides an ideal drive. The motor may be fitted onto the bandmill driving shaft or coupled to it.

The other major use of ceiling mounted motors is in textile mills on what are called two- and four-frame drives. These drives consist of an induction motor with shaft extended at either one or both ends for mounting either two or four pulleys. The motors must be equipped with extra heavy bearings and shafts to take care of the stress produced by the overhung pulleys. Extra pedestal bearings are often used with extended shafts to secure the proper pulley spacing.

There are very few wall-mounted motors used in industrial work today. This type of mounting requires a belt or chain drive, and as mentioned before, manufacturers are finding that the direct drive has very obvious advantages over these other forms.

Reduction of Noise

The problem of noise is becoming increasingly important, both from the standpoint of structural vibration and from the standpoint of the effect on the individual. The increased use of steel in factories and other buildings makes for increased structural strength but also provides greater resonant effects. For this reason, it is necessary to consider carefully the mounting of motors, especially those which are ceiling, wall, or floor mounted.

The noises caused by motors and machinery can be divided into two general classes: Mechanical noises, such as vibration caused by unbalanced machines and noisy flexible couplings; and windage noises. Magnetic noises and mechanical vibrations are best confined by using suitable sound-proof foundations, designed with special reference to the particular equipment being installed. Materials which can be used in constructing such foundations are cork pads, 2-3 in. thick, felt pads, sheet lead, and wood or sand used in combination with reinforced concrete or structural steel framing to secure the necessary rigidity to keep the machine in alignment.

Windage noises are not penetrating, and usually do not carry far. If it is feasible, the motor-driven unit can be confined in a special room, the walls and doors of which are lined with insulating material. Special lines of quiet operating motors have been developed by nearly all motor manufacturers. These motors have overhung stator and rotor slots of the proper number to give quiet operation.

What Is Fitting—*Discussion*

C. L. HENRY

THE definition of fitting (*AM*—Vol. 74, page 673) by our American cousin who calls it "the rectification of defective machining," is quite correct. Back in the 80's all machines were crude and defective and the work machined on them needed rectification by the skill of the fitter. The fitter enabled us to make more accurate machinery, which in turn produced more accurate machined parts, so our modern machinery is the outcome of the skill that the fitter of years ago put into his job.

Will the skilled fitter ever be entirely eliminated? I do not think he will. He is still necessary in the making of press tools, jigs, fixtures, and master tools. His services are still required in the fitting and assembling of accurate parts of aircraft. Developments which are the outcome of experiments will always require the services of a skilled fitter, even with all our modern machinery there will always be a percentage of parts machined that are defective. These can frequently be rectified by the fitter at less cost than to make replacements.

Materials are now machined very accurately but we have not as yet produced all materials that "stay put." They change their form, some rapidly, some slowly, but they do change, and here the skill of the fitter is needed.

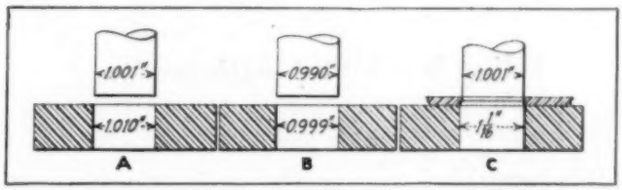
I started as a boy to learn the trade in the class then known as fitting and turning, and have followed very closely the changes brought about by the more accurate building of machinery. But I still find it profitable to utilize the services of the skilled fitter to put many final touches on work.

Ideas from PRACTICAL MEN

Relation of Die Clearance to Metal Thickness

JOHN J. MCHENRY

In addition to the work in our own die shop, there are times when we are compelled to engage several job shops to help us meet deliveries. Considering the pressure brought upon all concerned, the few instances of inferior stampings from the tools received are surprising. But—and it is a good-sized but—the lives of some tools so far exceed those of others as to be almost unbelievable. This aroused our curiosity, and we started to hunt for the cause of the variation.



In placing orders for tools, we either furnish the material or specify that which is to be used, so that in our investigation to locate the reason for their varied life we eliminated the factor of material. Naturally, we looked for die clearances and there found the trouble. We found variations of from three to twelve per cent of the work thickness as a total clearance between punches and dies. Checking along this angle, we found the most satisfactory clearance to be from five to seven per cent of the thickness of the metal worked.

It is true that a pierced hole is smaller than the punch that makes it, and that a blank is always larger than the die it goes through. While the amount varies somewhat, it is practically 0.001 in., and for that reason we use it as a base to work from. Assuming that we are to pierce a 1-in. hole in $\frac{1}{8}$-in. stock, the punch and the die would be made as at *A* in the illustration. Or, if we wanted a blank 1 in. in diameter, the punch and the die would be made as at *B*. These clearances work well and produce clean, uniform blanks free from burrs, and the tools are long lived.

And speaking of burrs; burrs are rarely formed because of excess clearance, except in metal that is extremely soft or of light gage. As proof of this, we countersink parts made from $\frac{1}{8}$-in. metal in the press, whereas the work was formerly done in the drill press. By excessive clearance in the die, as at *C*, we get a uniform break of $\frac{1}{32}$ in. all around. A restrike die smooths and brightens the rough break into a practical and serviceable countersink. Having attained our object, we went no farther along this line. Therefore, I cannot say what the limit might be.

It is equally true that a punch and a die might have the correct amount of clearance between them, but because of improper mounting they might throw a bad burr at some part of the blank. When examining a blank to detect such trouble, the tight spots, or lack of clearances, are indicated by the bright, shiny edges of the blank and the absence of breaks at those points. To guard against improper setting, the clearance should be checked by feelers after the tools have been mounted. Or, if the clearance is less than 0.002 in. on a side, the correctness of the setting can best be determined by smoking the punch with a kerosene torch, and then entering it into the die. The close points are where the sooty film has been removed in touching the die.

For clearances of 0.001 in., or less, the application of a solution of copper sulphate to the punch is even better than the smoke from the torch. Punches and dies can be lined up so that their operation will be a certainty. Blanks will be clean and die life can be measured by the material used and the heat-treatment it received. And, as in the case of the countersunk hole at *C*, it is evident that greater clearances than those specified can be used, and in fact may even be advisable, as in the case of piercing holes, the diameters of which are less than the thickness of the stock punched. Bearing these various facts in mind, I consider rules and formulas in die-making to be of inestimable value as reliable references when time and cost make experiment impossible. On the other hand, they are evidence only to what has been done, and not to what can be done. Deviation from standard practice will often give remarkable results.

Efficient and Easily-Made Press Tools
Discussion

ROBERT R. CORNELL
Division Superintendent, Gorham Company

In an article under the title given above (*AM*—Vol. 74, page 986), Wm. Butzlaff states that the press tools described by Charles H. Willey (Vol. 74, page 769) are far from being efficient. This statement is followed by a suggestion that in connection with feed rolls the work could be produced at the rate of from 12,000 to 15,000 per hour. Granting this modest speed to be possible in blanking parts from sheet metal, I also think it fair to assume that Mr. Willey had some good reason for making the bars out of cold-rolled bar stock. One reason could have been that such parts made from bar stock would have greater strength, as the grain of the metal would run lengthwise of the finished parts.

If these parts had been blanked from sheet metal, which I think Mr. Butzlaff probably had in mind, the

grain of the metal would have extended across the narrow and weaker section of the blank, rendering it more liable to breakage. Mr. Butzlaff makes claims that press tools that cannot be used at a faster speed than 33 strokes per min. are certainly out of date. I do not agree with him in this case and trust such extraordinary speed will not be required for any power press, the operator of which is engaged in deep drawing, forming or stamping operations of large and heavy work, to which Mr. Butzlaff has failed to give any consideration in his criticism. On the larger sizes of presses, no practical production man would either schedule or expect a production equivalent to 33 strokes per min., and certainly would not admit that all his tools were out of date that could not be operated at that speed.

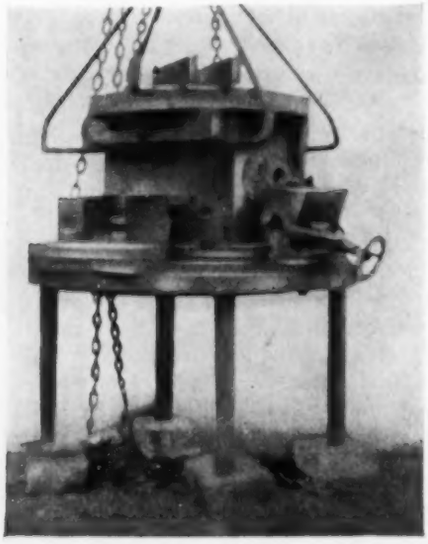
I do not believe that the ideas published in *American Machinist* are supposed to represent the best possible methods of production, as much as to show one possible way in which a job may be done, since there is no final perfection in either tools or machines. The greatest benefit is derived from these ideas by a thorough study of the details in the design of the tool or the machine, as shown, with the purpose of sometime incorporating the most valuable features of the ideas into similar tools, machines, or products. Such practice is interesting and productive of results to the reader.

Fixture for Casting Metal on the Hub Faces of Truck Boxes

L. S. TAYLOR

A fixture for casting lining metal on the hub faces of locomotive truck boxes to finished size, eliminating all machine work, is shown in the illustrations. In Fig. 1 the device is shown with a box in place, ready for pouring, while in Fig. 2 the details are given. The base of the fixture is made from an old cylinder head and is supported on legs of pipe. A recess as deep as the metal to be cast is counterbored in the base. A plate as thick as the depth of the recess is shaped to the inside dimensions of the box and is fastened in the recess with screws. Z-bars are bolted to each side of the base and the flanges of the box are slipped under them, liners to make the cast metal the required thickness being used.

If the thickness of metal wanted on different boxes varies, liners of different thicknesses are used. The liners are made in sets of two and are stenciled to indicate the thickness of the metal to be cast. The openings around the box are closed with fire clay, and a fountain is furnished to form a gate large enough to take care of the shrinkage. The fountain is made



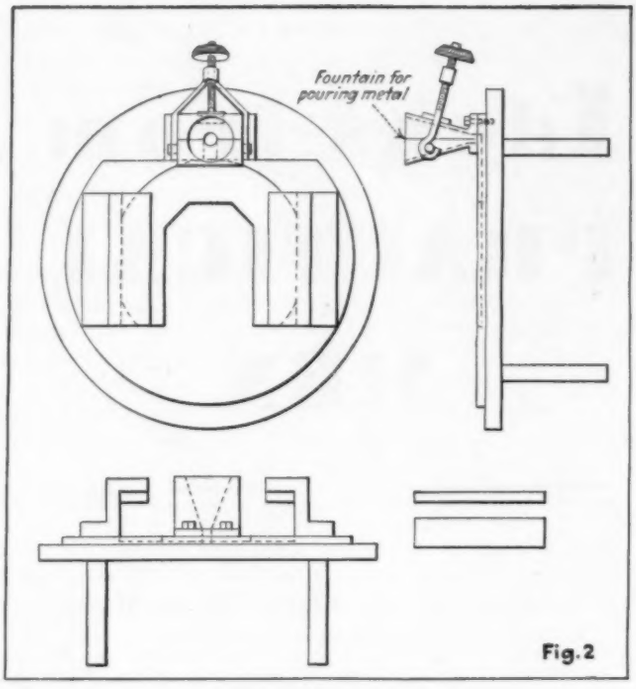


Fig. 2

in two pieces and the inner piece is removable, both parts being held together by a clamp. By the use of this fixture, the face of the cast metal is given a good finish and the metal itself is cast to the drawing dimensions in every detail. The box is preheated before placing it in the fixture by immersing it in molten metal. It is then tinned to insure that the metal will adhere tightly. The use of this fixture has materially reduced the cost of relining hub faces.

Filing Work Flat—*Discussion*

J. T. TOWLSON
London, England

It is impossible for me, an adept at flat filing, to resist making a fair comment on the article by Maurice Lambert, under the title given above (*AM*—Vol. 74, page 767). Mr. Lambert's article is a precise and particular expression of the inability of the present-day mechanics to file, and shows without doubt how the progress of machining has supplanted the first-class fitter and filer.

Filing flat is an art, and we old timers of half a century ago learned the trick. To file a flat on a round bar, or the length of a keyway in a pulley or a coupling was, and is, as easy and as natural as it is for a man to "poker" file today. There are men living who were reported to be able to file like a shaping machine, and there was no more need to check their work than if it had been done in a shaper. And with the art of filing once learned, it is never lost. Like swimming, it becomes a natural asset. As an example to which the pitch of filing reached ere machining took the work out of the fitter's hands, take the "pitching" and trimming of bevel gears. These gears were made of cast iron, and the teeth were "pitched" and trimmed by hand. As a means of power transmission they meshed with gears having wooden cogs mortised into cast-iron centers.

Men of that day, in England, at a rate of pay of no more than 28s. for a 54-hr. week, would "pitch" and trim such gears (up to and over 4 ft. in diameter) at from

½ to 1 d. per square inch. The profiles of the teeth were marked out on the larger and the lesser diameters, and so expert did the men become in chipping and filing that a straight-edge was never required to be used, the men being able to tell by the feel of the file when the teeth were flat from end to end.

Should it ever fall to the lot of any reader to have to do such "pitching" and filing of gears, or to even cut keyways in them by hand, let him always endeavor to chip hollow, so that the file when laid on the chipped surface will be without rock. That is one of the secrets of flat filing on such work. There are other secrets that can be learned only by experience.

Tool Steel Economies

HARRY SHAW
Heywood, Lancashire, England

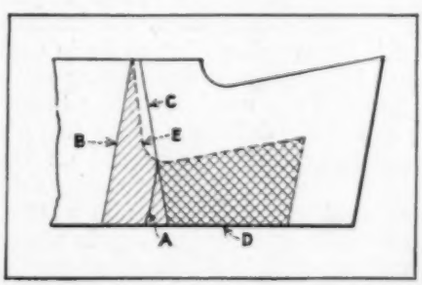
The usual claim in favor of toolholders and tipped tools is the saving of metal obtained by their use. But is there any saving of metal made by using toolholders and tipped tools? One-half and sometimes more of the tip, or the small inserted tool, is wasted, and in the forming of the tips and the tools, a large amount of metal is lost unless they are made by drop forging, which is not the common practice. There is one advantage with toolholders; that is that the tools are slightly more easily ground than are solid tools.

One firm with the practice of which I am familiar, discarded all the toolholders and tipped tools in favor of solid tools (except for the very small sizes) on the ground that the waste of steel when toolholders or tipped tools are used is 50 per cent, whereas the waste with the solid tools, when the methods to be described are used, is only about 10 per cent.

The following sizes of tools were standardized: 2x1¼ in.; 1½x1 in.; 1¼x¾ in.; 1x⅝ in.; and ¾x½ in. When the largest size of tool had been used until it was too short, usually about half its length, it was forged down to the next smaller size by power hammer. When this smaller size had become too short it was forged down to the next smaller size, and this procedure was followed until the final size was reached, after which, when too small, it was either scrapped or used in a toolholder for very small sizes.

The reader will be able to calculate for himself the amount of steel eventually scrapped when the tool had been forged down from the first size to the fifth, half the steel used up on each tool being used up at each size. He will find that it amounts to $\frac{1}{32}$ of the weight started with. To this must be added the loss in forging and also to the scrap due to the occasional splitting of a tool, which in most cases would cause it to be useless.

When it was found that there was a shortage of any particular size of tool, some material was forged down from the size next but one above it. Say there was a shortage in the third size of tools, then some material would be by-passed from the first size and forged down into the third size directly, skipping the second size.



The advantages of the solid tool are that it is as a general thing stronger than a tipped tool, even if the shank of the tipped tool is of the same size in section. Also, should a solid tool lose its temper by becoming hot in cutting, it can easily be retempered, but should it be necessary to retemper a tipped tool the brazing is likely to be spoiled—and brazing is not a cheap operation.

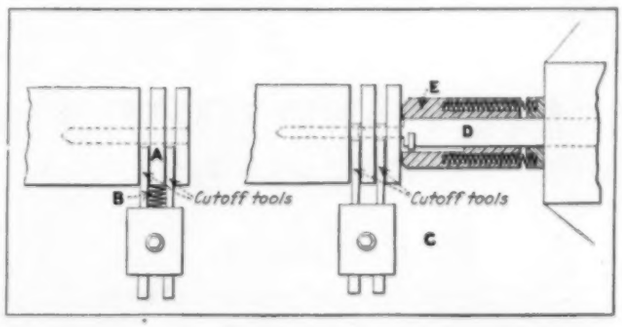
The usual method of grinding a solid tool is shown in the illustration, the full lines in which represent the shape of a new tool, while the dotted lines indicate the shape of the tool after it has been ground several times. When the tool has been ground to the shape shown, it is thin at the part *A* and is likely to break, consequently the usual practice is to grind it off at the line *B* and then form a new cutting edge. A considerable quantity of metal can be saved if the tool is turned over and ground to the line *C* and a new tool is made with the surface *D* at the top. The little step *E* is not practically detrimental to the tool, and when the tool has been ground once or twice it will disappear. The procedure outlined is repeated until the tool is too short to use. The amount of metal wasted by the two methods is shown by the hatching.

An Ejector for Screw Machine Work

CHARLES KUGLER

In cutting off more than one piece at a time in the screw machine, the part *A* would sometimes become wedged between the tools, causing considerable trouble. The well-known method of placing a spring between the tools to eject the part, as at *B* was tried, but it did not always do the work.

To overcome the difficulty, we made the ejector shown



at *C*. The bar *D* has a pilot that is a loose fit in the hole in the work and is held in the turret. The sleeve *E* slides on the bar *D* and is backed by springs. When the turret is moved forward, the pilot enters the work and the sleeve *E* contacts with the end of the work. As the forward movement of the turret is continued the springs behind the sleeve are compressed. The cutoff tools recede before the turret moves back, leaving the parts cut off on the pilot. Thus as the turret moves back, the springs are extended and force the sleeve forward, ejecting the parts from the pilot.

A pin in the bar, back of the pilot, engages a slot in the sleeve and prevents it from turning. It also acts as a stop to prevent the sleeve from being pushed off of

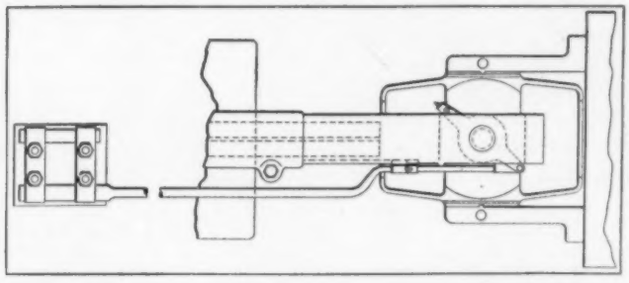
the bar by the springs. A small flat on the pilot, opposite the cut-off tools, acts as a clearance space to permit the work to be severed without the tools coming in contact with the pilot.

Machining a Concavity

D. Q. DUNSTONE
Hetton-le-Hole, England

The lathe set-up shown in plan in the sketch was devised in order to rebore a quantity of bearing housings having spherical seats. A faceplate fixture cradled one-half of each housing, locating it longitudinally by a spigot. The other half was held by two studs in the fixture, and was located by a spigot and a stepped joint.

One end of the 4-in. toolbar was bored for a driving



fit over the tailstock spindle, to which it was keyed. At the other end, the toolbar was provided with a 1x6-in. slot to receive the swinging cutter holder, as shown. Placing the tailstock between the carriage and the headstock, the swinging cutter holder was coupled to the carriage by a jointed rod. A crosshead near the joint of the rod was arranged to slide in a dovetailed slot in the toolbar to guide the main part of the rod. With this device we were able to feed the cutter over the concavity by means of the longitudinal traverse of the carriage.

SEEN AND HEARD

JOHN P. GODFREY

T-C Tools Again

T–C cutting tools seem to be more and more affecting machine design and the selection of materials as well. Chrysler is reported to have adopted a chrome nickel flanged brake drum that is so hard it can only be machined with T–C tools. This phase of design is interesting as showing a close tie-up between the designer and the production man, which is as it should be.

Handle 'em Carefully

T-C tools need care if best results are to be secured. The foreman and the operator should be told how to use them unless they have already had a wide experience. One shop never puts T-C tools on roughing work but saves them for finishing. Another shop uses T-C for roughing, and on interrupted cuts at that. But they have had experience and know how to handle them.

Cutting Both Ways on a Planer

Reversing the tool of a planer so as to cut in both directions has been "invented" again. It has probably been tried periodically ever since planers came into use. I first saw it on a planer that had cast-iron ways bolted to a granite bed and that was built before 1840. Whether the "reverser" was put on at first or added later no one seemed to know. Similar devices have been used on shapers at various times. Now it has been invented again. And it isn't safe to say that it may not stick this time even if it never has before, for conditions and ideas that were not successful years ago, sometimes become common practice later.

Fuel Oil as a Coolant

In the early days of machining aluminum we tried milk and even buttermilk as a cutting compound. It cooled all right, but the milk soon soured and became messy in many ways. Then nearly everyone drifted to the use of kerosene, and this seems to be a prime favorite in most shops. One bright shop man in search of greater economies tried using fuel oil, such as we feed our oil-fired boilers—and it worked. Now he is using the cheapest grade of fuel oil he can buy, saves money, and finds it works just as well as kerosene.

How Much Net Saving?

What net saving in direct labor warrants the purchase of a new machine? One large automobile concern sets the figure at 30 per cent. The machine carries an overhead of 15 per cent and to this is added the cost of tooling. If the net saving in direct labor does not equal 30 per cent per annum the new machine is not ordered.

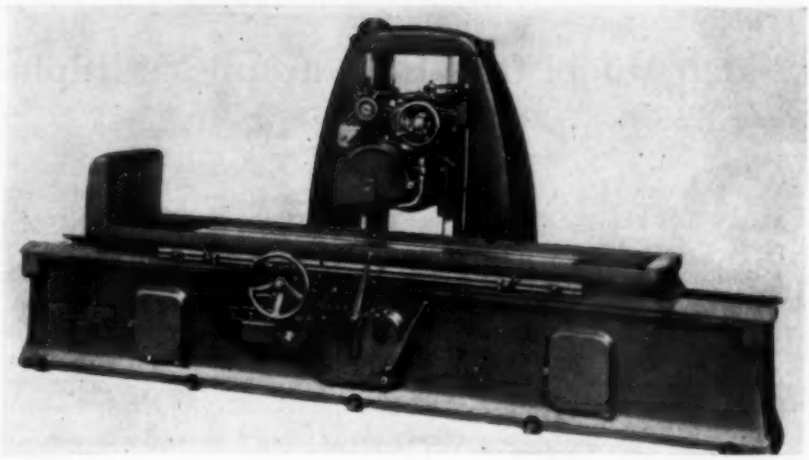
Reducing Gear Noise

Quiet gearing has become quite a problem in many industries but it is not as new a problem as might appear. For rawhide gears and pinions began to be used some fifty years ago to reduce gear noises to some extent. These have been supplemented by the many fabric base gears, now so widely used. But tooth form itself has a bearing on noise. A transmission plant found that on hardened gears the point of the tooth spread appreciably after cutting. Tests showed a point bearing which meant vibration and noise. Although being reluctant to depart from the use of standard form cutters the big boss was finally persuaded to try a modified form of cutter to give a narrower point on the tooth, and the noise disappeared. On soft gears the standard form of cutter is still used, the new form compensating for the tooth point expansion due to hardening.

Preparing for Emergencies

It may be bad psychology to "cross a bridge 'til you come to it" but there are many cases where the foreman who anticipates trouble by planning what to do in case of a breakdown, keeps his production line moving when the break occurs. In one large multiple-drilling operation they kept a single-spindle drilling machine just off the line, to drill any holes that were missed on the multiple, because of broken drills. An inexpensive drill jig enabled them to drill any hole that was missed. It seemed easier to stop the multiple and slip in a new drill, but the boss said it wasn't in this case.

SHOP EQUIPMENT NEWS



Mattison 16-In. High-Powered Precision Surface Grinder

Built-in motor drive for the spindle, hydraulic table feed, hydraulic wheel cross feed, power elevation of the wheelhead, and extra heavy and rigid construction are the outstanding features of the high-powered precision surface grinder announced by the Mattison Machine Works, Rockford, Ill. By mounting the motor rotor directly on the wheel spindle, it can be balanced as a unit so that no vibration is imparted to the wheel and full power is delivered direct to it. This wheel spindle and motor are mounted in a heavy housing, which is carried on horizontal V-ways of the wheel-slide assembly, which in turn is supported between two massive vertical columns with taper-gibbed ways.

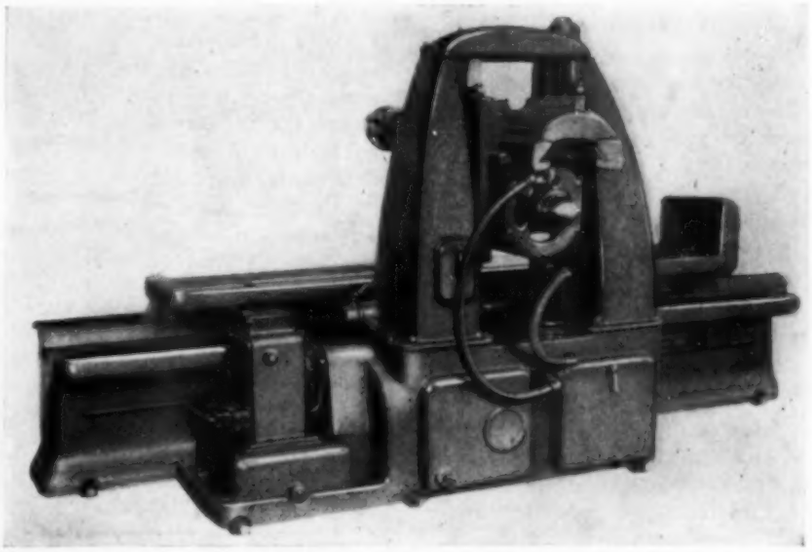
Either adjustable tapered bronze bearings or preloaded ball bearings are supplied on the spindle, which is 3½ in. in diameter at the front bearing, 2¾ in. at the rear bearing and 48½ in. long. The machine is designed for use with a grinding wheel 14 in. in diameter by 6 in. face by 5 in. hole. At a spindle speed of 1,150 r.p.m. this gives a cutting speed of 4,200 ft. per min.

Longitudinal table travel is by a hydraulically actuated ram. The stroke is adjustable to cover any portion of the table up to its maximum length by setting dogs at the side of the table. Table speeds range from 30 to 90 ft. per min. The working surface of the table is 16 in. wide by 6, 7, 8, 10 or 12 ft. long, as required. Wheelhead adjustment is such as to allow 17 in. in the clear between the table and a 14-in. wheel. Three ¾-in. T-slots are available for strapping work direct to table, or for holding a magnetic chuck.

Transverse feed of the wheelhead is also hydraulically operated, and it is entirely automatic when grinding. The feed is adjustable from ⅛ to 2 in. at each reversal of the table, allowing full advantage to be taken of the 6-in. wheel width. Both quick-acting and low-geared cross feeds, with automatic reversal, are available by a handwheel in the front, either for grinding or wheel truing.

Raising the wheel from the work is done electrically. The controlling push-button is located in the end of the clutch lever, so that with one movement, the hoisting motor is started and the power clutch engaged. Downward movement of the wheel is controlled by a separate "inching" push button enabling the operator to

Rear view of the Mattison Surface Grinder, showing the built-in motor mounted directly on the wheel spindle and the supporting columns for the wheel-slide assembly



spot the wheel just above the work. Final adjustment for grinding is made by handwheel and stop with micrometer graduations of 0.0001 inch.

Reversing of the wheel-slide traverse is accomplished automatically, both on hand and hydraulic feeds, by two dogs on an adjustable circular disk located directly in front of the operator. This mechanism also serves as a quick means for locating the wheel in the center of the work.

While the machine will accommodate large pieces of work, the table sizes were proportioned rather on the basis of accommodating more pieces of work per loading. A wide wheel is used to maintain a high metal-cutting capacity and sufficient power is provided to the spindle to accomplish this. Ample rigidity has been built into both the table and the head to assure a smooth finish.

All motors are of the inclosed, fan-cooled, line-start type to afford protection against oil, water and metal dust. The built-in spindle motor is rated at 25 hp., the motor driving the hydraulic, coolant and lubricating pumps at 7½ hp., and the wheelhead hoist motor at ¾ hp. Both these smaller motors are of the ball bearing type. Operating one push-button station simultaneously starts both wheel-spindle and pump motors. Full overload and under-voltage protection are provided.

The base of the machine has compartments for containing coolant tanks and the motors which drive the hydraulic and coolant pumps and hoist mechanism; also for the magnetic switches. The coolant tank holds 40 gal. and the pump has a capacity of 30 gal. per min. The hydraulic pump and its oil tank are placed on the pedestal at the rear.

Floor space, including extreme travel of table at both ends varies from 6 ft. x 18 ft. 6 in. to 6 ft. x 30 ft. 6 in. from the 6-ft. to the 12-ft. machines. Corresponding weights vary from 19,400 to 25,000 pounds.

Haynes Stellite J-Metal

A special grade of Stellite developed for cutting cast iron, semi-steel, and steel and known as J-Metal has been announced by the Haynes Stellite Co., Kokomo, Ind. Production tests have shown that J-Metal, with the same feed and depth of cut as usually employed when turning cast iron and semi-steel with Grade 3 Stellite cutters, will operate at a maximum speed 50 per cent greater than was formerly possible. At this higher speed the number of pieces per grind will equal that normally produced at slower speeds with Grade 3 cutters. At the same speed, feed, and depth of cut, J-Metal will show an increase in cutting life of at least 100 per cent over Grade 3 and a ratio of 4 to 1 over the number of pieces formerly obtained per grind. The J-Metal also shows the same qualities in steel cutting operations.

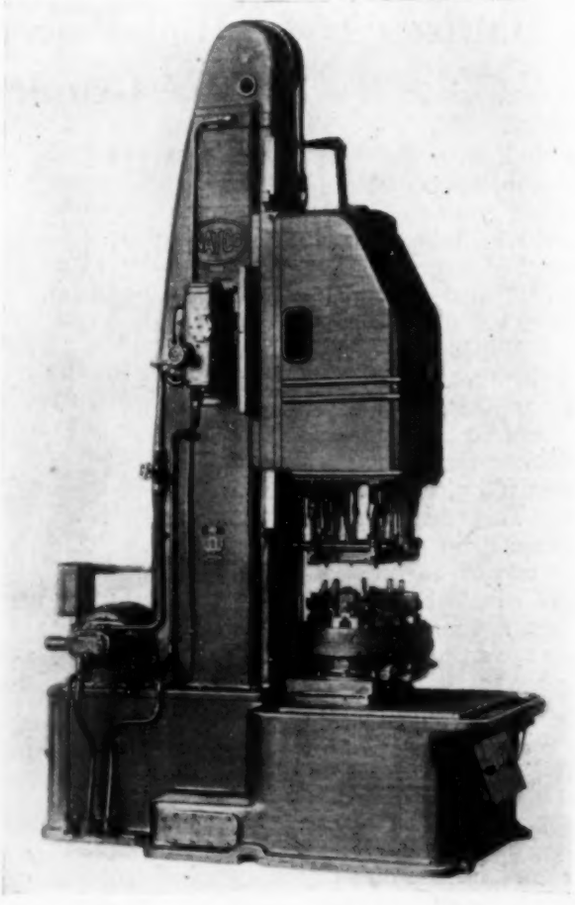
Stocks of Stellite J-Metal are now available for shipment in standard sizes of toolbits, welded tools and milling blades. Special tools can be made up for prompt delivery.

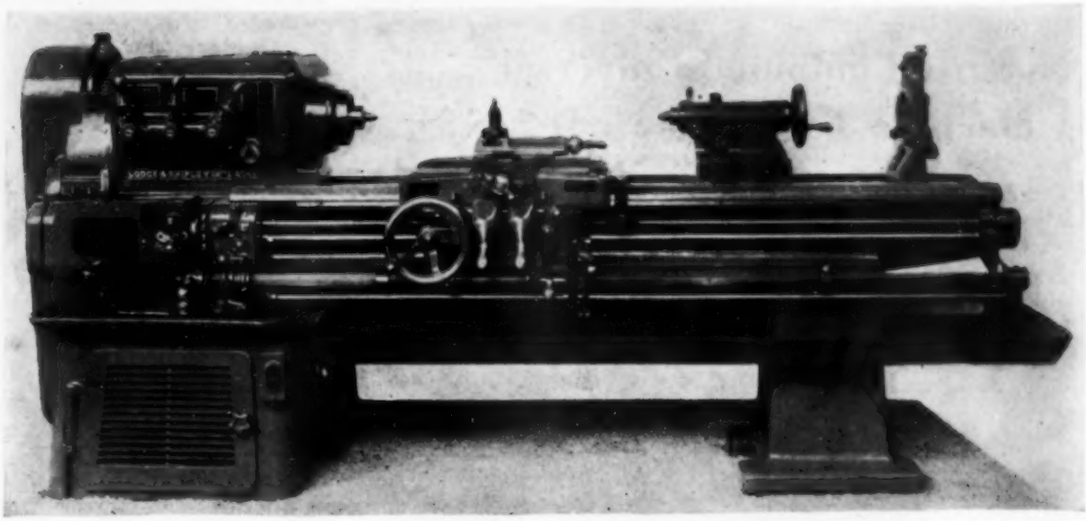
Natco Model C-12-H Hydraulic Multiple-Spindle Drilling Machine

Arranged only for the mounting of fixed center heads and comparable in capacity with the standard Natco 6-in. horizontal hydraulic unit, a vertical hydraulic multiple-spindle drilling machine, known as the C-12-H, has been developed by The National Automatic Tool Co., Richmond, Ind. This machine was designed with the basic idea of producing a vertical hydraulic drilling machine having the least possible number of parts, which are standard wherever possible. It can be provided with either a high or a low base standard equipment. The high base has a working surface of 36 x 29 in., approximately 24 in. above the floor line, and is provided with chip chutes and a clean-out hole in the front. The low base has a working surface of 36x32 in., approximately 9¼ in. above the floor line. It is intended for mounting high fixtures or where a box or rotating table is desirable in arranging the set-up on the machine. The rear section of both bases serves as a mounting platform for both the column and for the hydraulic pumping unit.

The inside of the rear section of both bases is used as a reservoir for the hydraulic system. The column is of the usual box section design with square ways and is mounted on the top of the base and held securely with heavy bolts. The column is provided with a top housing which carries a double sheave. On this sheave the cables are mounted connecting the counterweight inside the column to the slide which is mounted on the face of the column.

As stated previously, this machine





can be used only for fixed center work, and the fixed center cluster heads are mounted in the usual manner on the head slide. They are backed up by a motor housing which takes the major portion of the drilling thrust. The motor used is a vertical side-mounted type, and space is provided for a 10-hp. motor.

The pump unit is mounted at the rear of the column and on top of the base. It consists of a motor connected directly to a constant-pressure pump. A 1,200-r.p.m. motor is recommended for this drive. A 6-in. cylinder is provided to give 18 in. of travel, any portion of which can be used for various feeding rates. The standard Natco box valve is mounted on the left side of the column and works in connection with trip dogs on the head slide to control the head movement. Operating the pump at 200-lb. pressure provides a maximum feeding pressure of 5,600 lb., while operating the pump at 300-lb. pressure, as a special application, provides a maximum feeding pressure of 8,000 lb. A feeding rate of 15 in. per min. can be obtained. Rapid traverse is at approximately 80 in. per min.

The usual feeding cycle on the machine with standard equipment follows this sequence: rapid traverse down at approximately 80 in. per min.; feed at any rate from 0 to 15 in. per min.; rapid upstroke at approximately 80 in. per min., and stop. The operator starts the cycle by pulling up on the air valve handle, which is located conveniently at the right front corner of the machine. The remainder of the cycle is automatic.

Lodge & Shipley Selective Head Lathe with Roller Bearing Spindle Mounting

In addition to its regular line of lathes with plain white-metal spindle bearings, The Lodge & Shipley Machine Tool Co., Cincinnati, Ohio, is offering its selective-head engine lathes with a roller bearing spindle mounting. Three roller bearings are used, two "Zero Type" Timken tapered roller bearings on the front and one Norma Hoffmann roller bearing on the rear. As will be noted in Fig. 2, the double bearing mounting at the front gives greater capacity than a single bearing mounting, which is especially important for a lathe spindle, on which the greater percentage of the load is applied to the front bearings. This is especially true of short overhung chucking work.

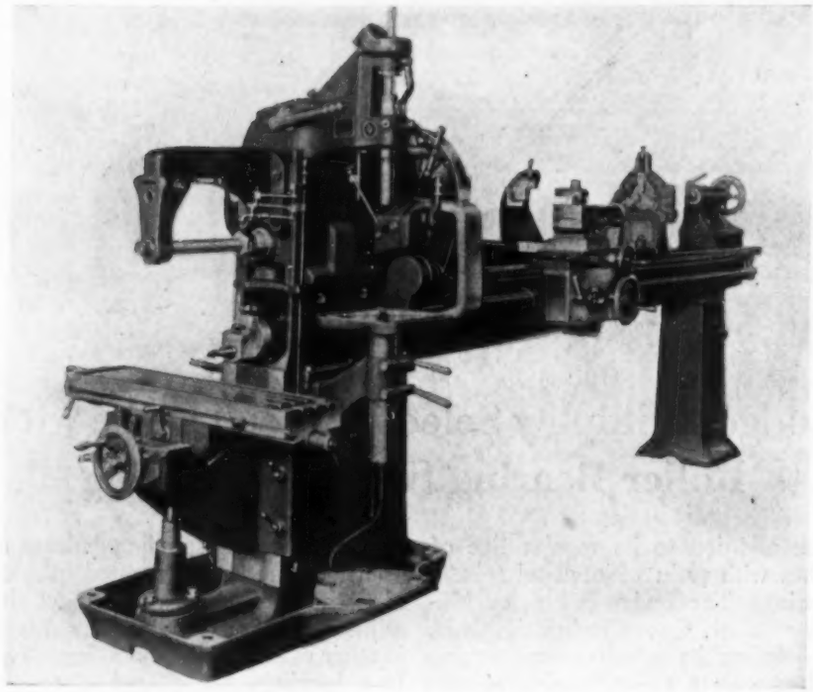
The two front bearings are opposed and the thrust in either direction is taken by them. The straight roller bearing on the rear leaves the spindle free for endwise movement when making adjustments. Since both the bearings taking up thrust are mounted in the front wall of the headstock casting, axial forces on the spindle do not tend to cock the bearings or bind the spindle. The design of this roller bearing spindle mounting is such that the heat generated in running the spindle does not affect the adjustment of the bearings as much as in other roller bearing mountings. The two bearings are placed close together and therefore the adjustment is affected by the expansion of only a comparatively short section of the spindle.

Adjustments to the bearings are made through an opening in the headstock cover. Both the front and rear bearings are automatically oiled from reservoirs in the front and rear walls of the headstock casting. The oil is filtered through felt washers and delivered to the bearings by means of oil tubes.

Constructional details of the rest of the machine are similar to those described on p. 491, Vol. 71.

Fig. 2—Cutaway view of selective headstock with the spindle mounted in roller bearings

Krause Combined Universal Machine Tool Model UM-2



Four machine tools are combined in the model UM-2 universal machine tool built by the Krause Co. in Germany and represented in the United States and Canada by H. A. Weaver, 8843 Livernois Ave., Detroit, Mich. The model UM-2 embodies a lathe, a drilling machine, a shaper and a milling machine. It is adapted for workshops in general, tool rooms, repair shops, ships, aircraft plants, utilities and also hangars and garages. Furthermore, it may be mounted on a truck for field work. It is furnished with all-geared drive, or drive from a countershaft, motor and belt, or by direct-connected motor. A flange motor drive can be supplied as a special drive.

With this equipment it is possible to keep three machines running simultaneously. The lathe and drilling machine are always ready for operation and either the milling machine or shaper can be used. All drives controlling working speeds of each individual machine are to the furthest extent independent from those of the others. The lathe, drill press and shaper are on the same level so that no twisting or one-sided strain results. The controlling levers are easily changed so that erroneous changing is almost impossible. The entire machine can be quickly stopped because the drive shaft is provided with a coupling brake.

SPECIFICATIONS

LATHE:

Swing over shear, in.	20½
Swing over gap, in.	28
Spindle hole, in.	1 3/16
Lead screw, threads per in.	4
Diameter of universal faceplate, in	17¾
Number of spindle speeds	6

MILLING MACHINE:

Dimensions of table, in.	37⅜x8¾
Automatic longitudinal traverse, in	23⅜
Cross movement along spindle axis, in.	7 1/16
Vertical feed, in.	18½
Diameter of milling arbor, in.	1
Number of spindle speeds	6
Number of feeds	7

SHAPER:

Stroke of ram, in.	9¾
Working range, in.	15¾
Dimensions of table, in.	37⅜x8¾
Greatest distance between table and lowest edge of ram, in.	7¾
Vertical feed of ram head, in.	2⅜
Number of feeds	7

DRILLING MACHINE:

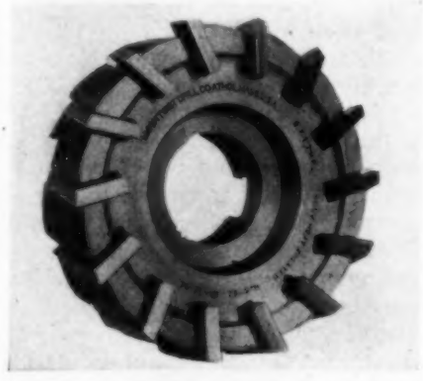
Capacity, in.	1¼
Depth of hole, in.	4⅜
Depth of throat, in.	8⅜
Diameter of spindle, in.	1
Number of spindle speeds	3

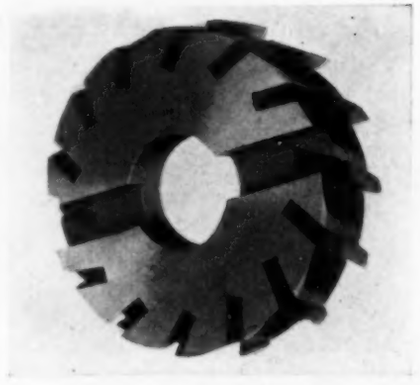
General specifications: power consumption, 4 to 5 hp.; net weight, belt drive, 3,600 lb., for lathe having a distance of 40 in. between centers. Lathes from 40 to 120 in. between centers are available.

Union Inserted-Tooth Cutters With Serrated Blades

Inserted-tooth cutters with high-speed steel blades serrated at the back and set with taper wedges in the front have been announced by the Union Twist Drill Co., Athol, Mass. Locking of the blades is positive and there is no give either radially or axially. No screws or intricate locking devices are employed. Blades can be adjusted closely and the radial adjustment is 1/16 in.

For face milling cutters from 4 to 7 in. in diameter the serrated blade shell end mill type is recommended. Dimensions of mill and arbor to fit are the same as for the National



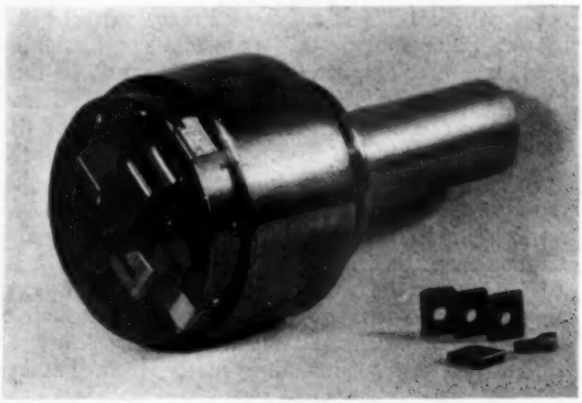


Standard solid shell end mills. For cutters 8 in. and larger, the company furnishes face mills to bolt directly to the standard spindle nose of a milling machine.

"H&G" Self-Opening Dieheads with Inserted Chasers

Resharpening or regrinding of chasers is not required on the "H&G" self-opening dieheads announced by The Eastern Machine Screw Corp., Truman and Barclay Sts., New Haven, Conn. Instead of the usual large chasers of high-speed steel, carriers are substituted that take small high-speed inserts. These inserts are held in place by a single screw that has a draw-in feature which locks the insert back in the carrier to insure trackage and even distribution of the cut. These inserts are small and inexpensive and may be quickly replaced. The carriers for any diehead size are made to take inserts for a definite diameter range. For example, one range is for threads up to ½ in. in diameter, another for diameters above ½ in. up to ¾ in. and another for above ¾ in. up to 1 in.

The same carriers are used for both the coarse and fine pitch series since the correct helix angle is found in the chasers. The carriers themselves are larger than the usual chaser and hence have nearly twice the amount of wearing surface where they slide in the carrier slots in the body of the diehead. Another feature is that a set of chaser inserts for cutting ½ in., 13 threads per in., may be used in any size diehead of this type. This simplifies the manufacturing problem as well as the customers' stock. When the insert chasers have been run to a point where threads no longer fit the gage, a new set is inserted with almost no loss of time and accurate threads are again being cut with no adjustment for length of thread required. When changing chasers, it is not necessary to screw a gage in the diehead to adjust for size as almost no diameter adjustment is necessary, even when shifting to another thread size. Either the insert chaser may be removed at the machine, without removing the carriers, or the carriers with inserts may be removed. The dieheads are manufactured in three sizes, which cover the range from ¼ to 1 in.



The small high-speed steel inserts offer economy and quick changing when worn

Hercules Belt Sander

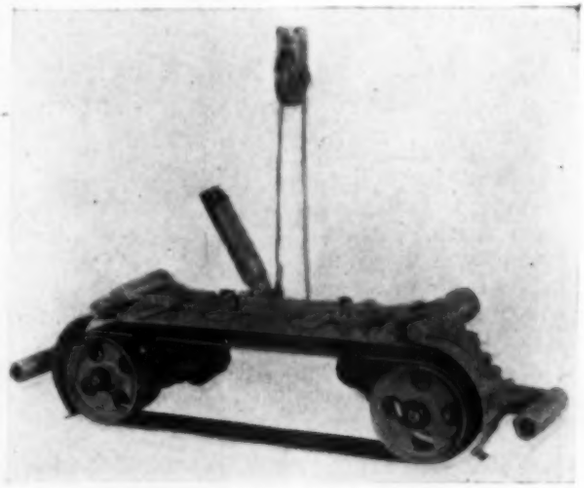
For smoothing down welds, sanding auto bodies, smoothing up large steel dies, and finishing sheet metal, a portable belt sander has been announced under the Hercules trade name by The Buckeye Portable Tool Co., Dayton, Ohio. This sander will work on either flat, convex or concave surfaces, a special attachment for concave surfaces being an added feature. The sander, which is suspended over the job by a suspension pulley and cable, is handled by one man. It is powered by two No. 300 type Hercules rotary air motors developing 1½ hp. each at an air pressure of 85 lb. per sq.in. The motors are placed directly back of each pulley and are direct connected.

The motors are forced out to tighten the belt by means of two small air cylinders mounted on the main frame. When the throttle is opened the air pressure passes first into these cylinders, tightening up the belt, and then into the motors proper. When the throttle is shut off all tension on the belt is relieved. The wheel guards can be removed quickly. The belt size is 2¾x57 in., distance between pulley centers being 21 in. The motor speed is 4,300 r.p.m., and the weight is 46 lb. Handles at each end afford convenient use of the device.

"O. K." Tungsten-Carbide Cutter Blades and Tools

Cutter blades tipped with tungsten-carbide and tools embodying these blades are being manufactured by The O. K. Tool Co., Inc., Shelton, Conn. The cutter blades are made in many varieties and shapes and are applicable to milling cutters, boring and facing tools and single toolholders. They are offered to be interchangeable with any of the standard cutters now used. Toolbits are also manufactured for use on lathes, planers, shapers and boring mills. Toolholders using round shank O.K. toolbits are available. A single holder on a machine uses every shape of bit. Straight tools, right-hand tools or left-hand tools can be inserted. Carbon steel toolbits are fitted with a tungsten-carbide tip.

Standard face mills and end mills are available with tungsten-carbide blades for general milling operations. Boring heads and facing heads are also available.



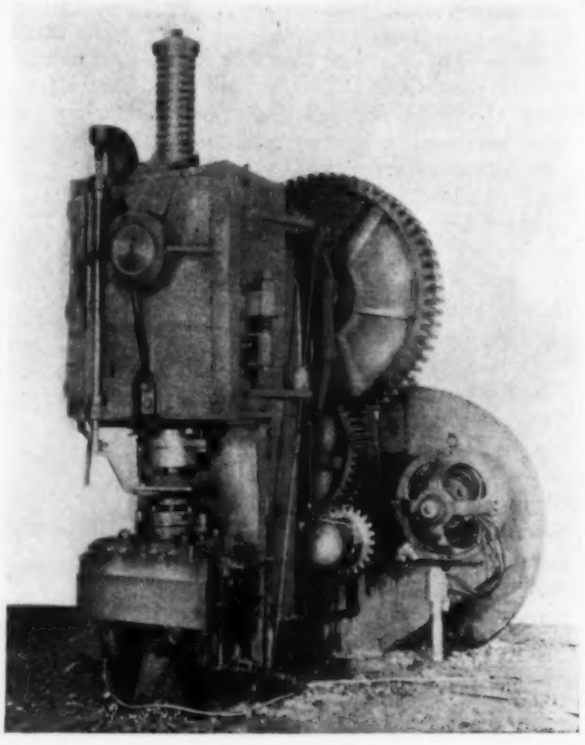
Two direct-connected air motors drive the belt of this Hercules Belt Sander

Reading Punch Press for Large Washers

In cooperation with engineers of Lukenweld, Inc., Coatesville, Pa., the Heavy Machinery and Hydraulic Equipment Department of the Reading Iron Co., Reading, Pa., has designed and built a heavy-duty washer punch press with a ram pressure of 525 tons. This press is capable of cold-punching at one stroke, complete washers up to 6 in. outside diameter and 3 in. inside diameter, from rolled steel plate up to ⅝ in. in thickness.

The press is equipped with a mechanism which ejects the punched washers from the dies and places them on a throw-out arm, from which they are deposited in a receptacle at the side of the machine. Power is provided by a 25-hp. motor arranged to give a final ram speed of 40 strokes per min. for small washers and 20 for large washers. The method of transmitting power from the motor to the pitman was devised to take advantage of the fact that the welded rolled steel flywheel can be run with safety at considerably higher speeds than will be suitable for a cast-iron flywheel. The higher-speed operation permitted the use of a lighter-weight flywheel to store up the necessary energy and effected a weight-saving which reduced some of the bearing loads.

The housing and outboard bearing stand assembly, gears, pinions, flywheel and other parts of the press are fabricated. A reduction of over 2½ tons in the total weight of the press was accomplished through this construction. In redesigning the press for utilization of welded steel construction, particular attention was given to the study of stress concentrations. As a result, the housing and outboard bearing stand assembly, or main frame, is comparatively free from stress concentrations, and possesses the required rigidity and strength to prevent spring in the frame. As a result, die cost and wear are reduced and the number of grindings that are required for a run are also reduced. The press is in service at the plant of the By-Products Steel Corp., Coatesville, Pa.

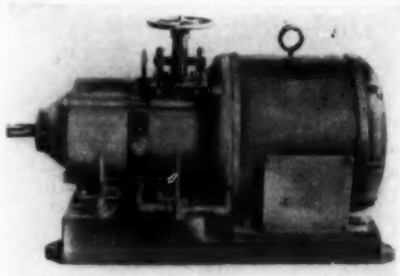


Hele-Shaw 5-Hp. Electro-Hydraulic Transmission

A compact 5-hp. electro-hydraulic transmission has been announced by the American Engineering Co., Philadelphia, Pa. The transmission will develop full-rated torque at any speed, whether it be 1 r.p.m. or 1,000 r.p.m. Since the torque is constant the horsepower output varies with the speed of the hydraulic motor. At maximum speed the transmission will develop 5 hp. continuously.

In the accompanying illustration the hydraulic motor is located at the left, the hydraulic pump in the center, and the electric motor at the right. These three units are mounted on a single bedplate reservoir, which contains the oil used in the system. The entire transmission, including motor, is 30 in. long, 14 in. wide and 16 in. high. The pump and motor are multi-cylindered and handle the fluid in a smooth, continuous stream.

The electric motor drives the pump shaft at a constant speed. Oil is delivered by the pump to the hydraulic motor at a rate corresponding to the stroke of the pump, which is

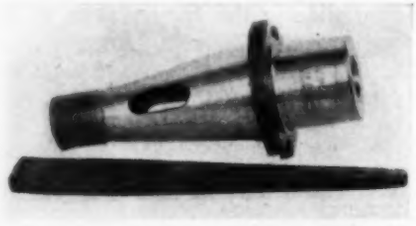


regulated by the handwheel or any other desirable hand or automatic control. This is the only point of regulation, since there are no controls on the electric or hydraulic motors. Through the handwheel the speed of the hydraulic motor can be varied all the way from zero to maximum in either a forward or reverse direction.

The pump end of the electric motor shaft is fitted with a fan. Oil in the system passes through a finned tubing surrounding the fan and consequently its temperature is maintained at a degree commensurate with efficient operation.

Brown & Sharpe Cutter Adapters for No. 40 Taper Spindle Ends

The Brown & Sharpe Mfg. Co., Providence, R. I., has announced cutter adapters for use with milling machines having standardized spindle end with No. 40 taper, to accommo-



date end mills, and collets having No. 3 Morse and Nos. 7 and 9 Brown & Sharpe taper shanks. While at the present time there are few milling machines with the No. 40 milling machine standard taper end, these

adapters anticipate present plans of machine tool manufacturers to incorporate this taper in machines of small sizes. The adapters will find usefulness among manufacturers who may have milling machines having the standardized spindle end, and who may wish to use end mills, collets and other tools having the Morse and Brown & Sharpe tapers mentioned.

Van Norman No. 11 Milling Machine

A small motor-driven No. 11 milling machine has been announced by the Van Norman Machine Tool Co., Springfield, Mass. The No. 11 supersedes the No. 10 and the No. ½ small milling machines. The motor is mounted in the base and is aligned for roller chain drive by means of an adjusting plate. The roller chain is inclosed in a cast-iron housing. Louvers are cast in either side of the motor compartment to assure ventilation. Like the No. 21 machine described on page 329, Vol. 74, the No. 11 has a pivotally adjustable cutter head mounted on a horizontally slidable ram.

SPECIFICATIONS

MAIN HEAD OR RAM:
- Length, in. 22
- Movement in and out of column, in. 8
- Ram bearing on column, in. 14

OVERHANGING ARM:
- Diameter, in. 2⅜
- Length, in. 28

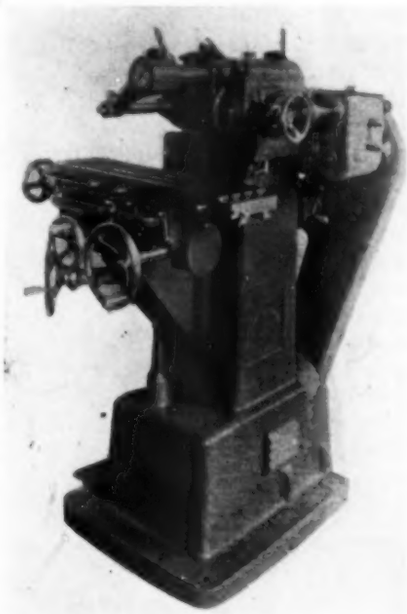
SADDLE OR CARRIAGE:
- Length, in. 18¼
- Hand cross feed, in. 6½
- Power traverse feed, range, in. 16

The cutter head is pivotally adjustable and is mounted on a horizontally slidable ram

TABLE:
- Feed, in. ..... ¾ to 14¾
- Length, in. 30
- Table run (automatic), in. 16
- Workholding surface, in. 27x7½

SPINDLE:
- Length, in. 11 11/16
- Spindle speeds ..... 50, 90, 120, 220, 280 and 508 r.p.m.

GEAR BOX ..... 18 changes of speeds



Chain drive is furnished from the motor in the base to the change gearbox

KNEE:
- Vertical range from center line of arbor in horizontal position to top of table in lowest position, in. ... 15
- Maximum distance between top of table and cutting edge of standard end mill with head in vertical position, in. 8¼
- Maximum distance from face of column to center line of spindle with head in vertical position, in. 7

Motor required ..... 1 hp., 1,200 r.p.m.
Weight of machine without motor, lb. 1,675

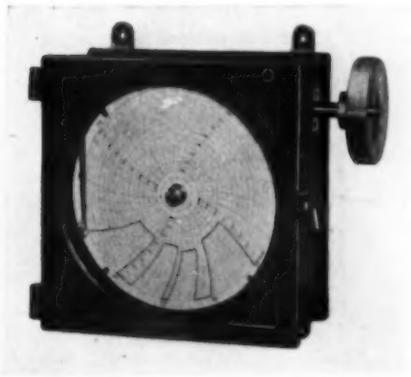
Special equipment, which can be furnished, includes worm index centers, high-speed milling attachment with ¼-hp. motor, and taper collets and arbors of various diameters and lengths.

Amthor Operation Recorder

An operation recorder using an 8-in. round chart has been developed by the Amthor Testing Instrument Co., Inc., 309 Johnson St., Brooklyn, N. Y. With this recorder it is possible to trace and check the basic causes for production losses. The chart is graduated to record any specified unit of output which is a function of or depends upon the speed or rate of production of the machine. The recorder shows the speed or rate of production at any time and every change in speed. It shows starting and stopping times, slowdowns, nonproductive periods, the time and duration of each, and the actual production and idle time.

The recorder movement is based on the centrifugal principle and the motion of the governor is transmitted directly to the pen arm by connecting links. Direction of rotation has no effect upon the governor mechanism. The chart is driven by a standard clock movement to give a 12- or 24-hour record as specified.

The recorder can be applied to practically any type of industrial plant machinery and also can be built-in to check the correct speed of operation so as to produce work of the proper quality. Wear in the instrument is eliminated by the use of precision ball bearings. The instrument is constructed with a drive on either side or back drive as desired, and for use with either belt, coupling or flexible shaft connection. It is fully moisture-proof and is furnished in dull black enamel.



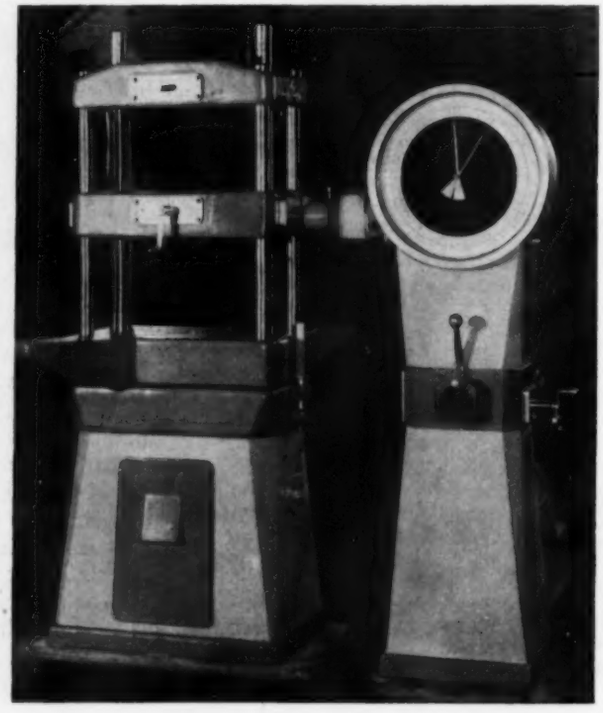
Centrifugal indicating means are used in this Amthor Operation Recorder

Riehle Precision Hydraulic Universal Testing Machine

Accuracy to within one-half of one per cent is guaranteed in the hydraulic universal testing machine announced by the Riehle Bros. Testing Machine Co., 1424 North Ninth St., Philadelphia, Pa. Among the features which make for convenience in use are: single lever control; self indication; dual load range on a single dial; instant load range transition; instant locking and self-releasing grips; convenient location of motor switches; wide space between screws; convenient storage space; head travel indicator; instant changing tools and grips; sensitive speed control; quiet operation; flexibility of set-up, and an open-scale, easily read dial. The machine is manufactured in five sizes having capacities of 60,000, 120,000, 200,000, 300,000 and 400,000 lb.

The machine is built in three distinct units: the loading unit, the indicating unit and the power unit. The loading unit consists of the upper and lower heads in which are the grips for tension testing. The lower head is sustained by two large screws set in the base, and bronze nuts in the head are actuated by a motor and worm drive for moving the head up and down for adjustment. The table is supported on the ram which with its cylinder is housed in the base casting. When hydraulic pressure is applied to the ram, it lifts the table and with it the upper head. As the lower head is stationary, a specimen gripped in the upper and lower heads will receive a tensile load while one placed between the table and the lower head will be loaded in compression. The grips are of the familiar wedge type. But where the usual type grips must be moved up or down to seize the specimen, these grips move horizontally until they engage. When the specimen is strained, they slip on inclined surfaces as in the usual type, so as to maintain their hold on the specimen. On the older type mechanisms it frequently happened in closing the second set of grips that the hold of the first set was released. But with horizontally operated grips this cannot occur. All tools and other small equipment are stored in a storage space in the base to which access is given by a large door.

For the weighing unit, the pressure from the main cylinder is brought through a transfer valve so that it may be applied either on one plunger working singly or on two plungers working in opposition. These plungers are of the unpacked or floating type and are oscillated rapidly by means of an individual motor drive. Whether one plunger is working alone or both plungers opposed, the resulting effort is counterbalanced by the buoyant effect of a steel float in a pool of mercury. When the single plunger is working, one-fifth of the hydraulic pressure capacity is sufficient to submerge the float to its full depth. When the two plungers are working in opposition it requires the full capacity pressure to submerge the float. This arrangement affords a simple and direct means of obtaining full-scale load indications either at full capacity or one-fifth capacity on a 20-in. dial. Changing from the full to the fractional scales requires only manipulation of the transfer valve.



Ramet Toolpak

Five small Ramet tipped tools, a toolholder and a special grinding wheel are packed in a wooden case, comprising the Ramet "Toolpak," announced by the Ramet Corp. of America, North Chicago, Ill. Heretofore the advantages and economies of Ramet (tantalum-carbide-tipped) tools have been available only to large production plants because of the cost of special tool designs. The Toolpak, however, provides a number of inexpensive toolbits of various shapes to handle a wide variety of work.

Two right-hand, one left-hand, one round nosed and one grooving tool are contained in the set and are adapted to the varied jobs of ordinary shops. In order that longer tool life may be had, a toolholder specially designed to give the proper support and top rake is included in the set.

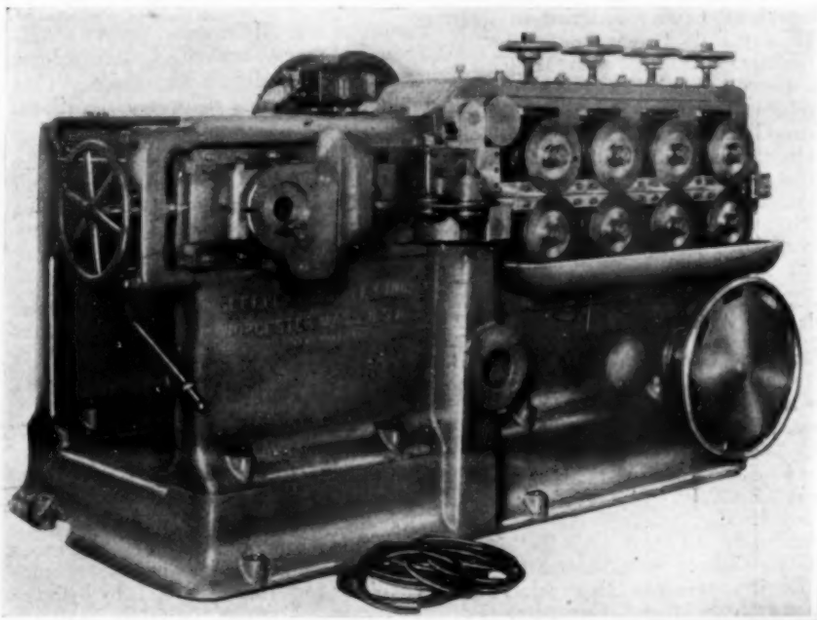
These tools are tipped with Ramet, a tantalum carbide developed by the above corporation, and should be ground on suitable wheels in order to get a keen cutting edge and to minimize the amount of material removed in sharpening. A special grinding wheel, which will fit practically all bench grinders, is furnished with the Toolpak. The price of the set is low.

EQUIPMENT ADAPTATIONS

RECENTLY DEVELOPED BY THE MAKERS

Sleeper & Hartley Coiling Machine for Ford Starter Rings

Sleeper & Hartley, Inc., Worcester, Mass., has supplied to the River Rouge plant of the Ford Co., a machine for coiling starter rings. The machine coils $\frac{3}{8}$x1 in. Maxel, a tough special alloy steel, edgewise into 14-in. rings. These rings are the blanks for the flywheel ring starting gear which is used on all Ford motors. The production is 85 rings a minute, cutting each blank to exact size so that the ring is ready for immediate butt welding. After this operation it is annealed and machined, 112 teeth being cut in the circumference. The ring is pressed over the engine flywheel where it is engaged by the starting motor pinion.



The coiling machine weighs 15 tons and holds the ring to a tolerance of 0.0025 in. Stock is fed from 400-lb. bundles to the coiling mechanism through four pairs of rolls having knurled surfaces. On emerging from the feed rolls the stock is started in the desired curvature by deflector rolls. The strip then passes between coiling rolls which give the ring its final shape, and which are adjustable. The ring is then guided to the shear by a series of rolls and at the proper instant the feed is stopped through a cam motion and the shear cuts the completed ring. By adjustment, the ends of the ring can be made to overlap, just touch, or leave a decided gap. Since the ring is to be butt welded, the machine is adjusted to have the ends of the ring just touch.

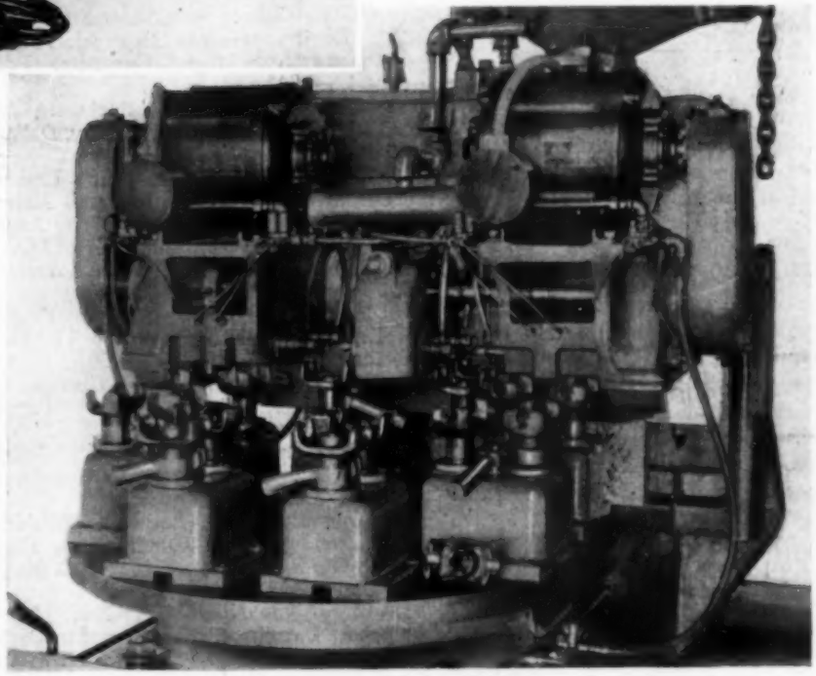
"Producto-Matic" Milling Machine for Slotting Universal Joint Parts

An adaptation of the standard "Producto-Matic" milling machine for milling slots on universal joint parts has been produced by the Producto Machine Co., Bridgeport, Conn. The bed and base of the machine are the company's standard model, but the entire head is special in design. Eight slots are milled simultaneously at each indexing, thus giving four finished pieces.

Two 1-hp., 1800-r.p.m. motors are mounted to the left and right of the head of the machine for driving the spindles by chains, the left-hand motor driving the two left-hand spindles and the right-hand motor driving the two right-hand spindles by chains and the four spindles of the center housing by a shaft.

Since the universal joint parts have collars of two different heights and are mating parts, two complete sets are milled at each indexing, slots being milled simultaneously, on each of the two arms of each of the four universal joint parts. The milling cutters used are $1\frac{1}{16}$ in. in diameter and turn at 500 r.p.m. Slot width is 3/32 in. Production on these drop forgings is 800 pieces per hour.

The turret indexes 90 deg., thus having four stations and eight fixtures. Fixtures are spring-clamped



but hand-released and locating is done on the spline of the pieces. Turret indexing and cutter feeds are both cam-controlled by cams at the rear of the machine in the usual way.

Hanna Riveting Machine for Blower Rotors

For the assembly fabrication of a blower rotor, a special riveting machine has been developed by the Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill. This machine is used to rivet curved blades to the circular side plates, and the rivets are driven cold. The back plate is flat and the rim plate is

conical. The riveter "buck up die" stake, which enters between the plates and the blades, must be of one shape for rivets in the flat back plate and of another shape for the rivets in the conical rim plate. As the rotors may be for right- or left-hand rotation the blades may curve clockwise or counter clockwise. Consequently, two pairs, or four distinct stakes are required. These stakes may be interchanged rapidly. Since accuracy and rigidity of mounting are essential for these stakes, they are mounted by two bolt-drawn wedges and also two bolts which grip the stake between the two side walls of its slot in the riveter main frame. Ordinary variations in rivet lengths and plate thicknesses are automaticlly taken care of by the uniform pressure range of the die stroke.

PATENTS

SEPTEMBER 15, 1931

Metal-Working Machinery

Presses for Drawing Sheet Metal. Charles Joseph Rhodes, Wakefield, England. Patent 1,822,906.

Machine Tool Unit. Robert M. Galloway, Richmond, Ind., assigned to The National Automatic Tool Co. Patent 1,823,038.

Finishing and Polishing Machine. John M. Nash, Milwaukee, Wis. Patent 1,823,625.

Armature Commutator Resurfacing or Cutting Machine. Claud R. Brown and Jesse F. Thomas, New London, Wis. Patent 1,823,642.

Work Positioning Means for Centering Machines. John J. Thacher, Wethersfield, Conn., assigned to Pratt & Whitney Co. Patent 1,823,670.

Crankshaft Lathe. John M. Christman, Detroit, Mich., assigned to Packard Motor Car Co. Patent 1,823,727.

Gear Grinder and the Like. Orlando Garrison, Dayton, Ohio, assigned to Pratt & Whitney Co. Patent 1,823,734.

Machine Tool for Dressing Articles on Nonparallel Surfaces. Robert L. Dyas and Joseph Maickel, Butte, Mont. Patent 1,823,824.

Tools and Attachments

Variable Speed Unit. Paul B. Reeves, Columbus, Ind., assigned to Reeves Pulley Co. Patent 1,822,935.

Speed Indicator. Florence C. Biggert, Jr., Crafton, Pa., assigned to United Engineering & Foundry Co. Patent 1,822,950.

Tool Holder. Gerald A. De Vlieg, Rockford, Ill. Patent 1,823,032.

Sliding Caliper with Automatic Locking Device. George Hommel, Aldingen, near Spaichingen, Germany. Patent 1,823,045.

Motion Controlling Attachment for Cutting Torches. Jesse L. Gray, Dallas, Texas. Patent 1,823,194.

Chasing Attachment for Lathes. Theodore A. Wettig and Charles Meier, Cincinnati, Ohio, assigned to The Acme Machine Tool Co. Patent 1,823,242.

Stop Gage. James Gordon, Sorrento, Argentina. Patent 1,823,268.

Machine Wrench. Walter Ferris, Milwaukee, Wis., assigned to The Oilgear Co. Patent 1,823,426.

Bearing Cap Facer. Gustav C. Monckmeier, Tipton, Iowa. Patent 1,823,461.

Die. Russell H. Bowen, Philadelphia, Pa., assigned to The American Pulley Co. Patent 1,823,557.

Apparatus for Cleaning Polishing Wheels. John J. Cunningham, Dayton, Ohio, assigned to Melrose G. Kopf. Patent 1,823,645.

Gaging Machine. William Henry Baker, Detroit, Mich., assigned to Packard Motor Car Co. Patent 1,823,719.

Indicator. Jesse D. Langdon, Los Angeles, Calif., assigned to Langdon Engineering Corporation. Patent 1,823,746.

Liquid Tachometer. Samuel R. Puffer and Sanford A. Moss, Lynn, Mass., assigned to General Electric Co. Patent 1,823,841.

Cutter Head. Elmer S. Shimer, Milton, Pa., assigned to Samuel J. Shimer & Sons, Inc. Patent 1,823,846.

TRADE PUBLICATIONS

BALL BEARINGS. The New Departure Mfg. Co., Bristol, Conn. has issued its eighth edition of "New Departure Ball Bearings," covering dimensions, load data, and list prices. Important revisions and additions to previous listings of types, capacities, dimensions, and mounting details are made. This bulletin supersedes all previous editions.

CAST STEEL. The Alloy Cast Steel Co., Marion, Ohio has issued a booklet entitled "Cast AL Steel—Alloy and Carbon" presenting the characteristics of the steel castings which the company is prepared to furnish, and showing many typical parts.

DIEHEADS. The Eastern Machine Screw Corp., New Haven, Conn., has issued a folder on its self-opening dieheads with insert chasers. A complete description of the diehead and a list of sizes manufactured is included.

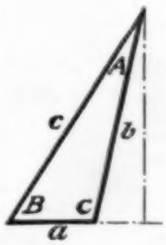
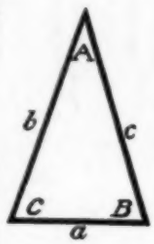
HYDRAULIC TABLES. The Baldwin-Southwark Corp., Philadelphia, Pa., has issued Bulletin No. 25 entitled "Hydraulic Tables and Other Data." This booklet is for the engineer engaged in the design or use of mechanisms for producing loads by hydraulic means. Many of the tables have not been published previously. The booklet contains 31 8½x11 in. pages.

SHAPE CUTTING. The General Welding & Equipment Co., 70 Lansdowne St., Boston, Mass., has issued a booklet entitled "Machine Cutting — A Historical Lesson in Fundamental Economics." Its contents cover: the main fields of machine cutting and its importance for the industry; machine cutting; and automatic cutting machines. The booklet is very completely illustrated throughout with pictures of the machines, types of work which can be done, and also gives data on consumption of gas and the cutting times.

SPEED REDUCERS. The Universal Gear Sales Corp., Indianapolis, Ind. has issued a bulletin on "Heliocentric" speed reducers, which gives complete information on the design, sizes and construction of these units, which may have either clockwise or counter-clockwise rotation. The bulletin contains 75 8½x11 in. pages with tables.

American Machinist
Reference Book Sheet

TRIGONOMETRIC SOLUTIONS FOR TRIANGLES

Given	$a =$	$b =$	$c =$	$A =$	$B =$	$C =$
a, b, c				$\cos^{-1}\frac{b^2+c^2-a^2}{2bc}$	$\cos^{-1}\frac{a^2+c^2-b^2}{2ac}$	$\cos^{-1}\frac{a^2+b^2-c^2}{2ab}$
b, c, A	$\sqrt{b^2+c^2-2bc\cos A}$				$\tan^{-1}\frac{b\sin A}{c-b\cos A}$	$\tan^{-1}\frac{C\sin A}{b-c\cos A}$
b, c, B	$\frac{b\sin A}{\sin B}$			$180°-(B+C)$		$\sin^{-1}\frac{C\sin B}{b}$
b, c, C	$\frac{c\sin A}{\sin C}$			$180°-(B+C)$	$\sin^{-1}\frac{b\sin C}{c}$	
a, c, A		$\frac{a\sin B}{\sin A}$			$180°-(A+C)$	$\sin^{-1}\frac{C\sin A}{a}$
a, c, B		$\sqrt{a^2+c^2-2ac\cos B}$		$\tan^{-1}\frac{a\sin B}{c-a\cos B}$		$\tan^{-1}\frac{C\sin B}{a-c\cos B}$
a, c, C		$\frac{c\sin B}{\sin C}$		$\sin^{-1}\frac{a\sin C}{c}$	$180°-(A+C)$	
a, b, A			$\frac{a\sin C}{\sin A}$		$\sin^{-1}\frac{b\sin A}{a}$	$180°-(A+B)$
a, b, B			$\frac{b\sin C}{\sin B}$	$\sin^{-1}\frac{a\sin B}{b}$		$180°-(A+B)$
a, b, C			$\sqrt{a^2+b^2-2ab\cos C}$	$\tan^{-1}\frac{a\sin C}{b-a\cos C}$	$\tan^{-1}\frac{b\sin C}{a-b\cos C}$	
a, A, B						$180°-(A+B)$
a, A, C		$\frac{a\sin B}{\sin A}$	$\frac{a\sin C}{\sin A}$		$180°-(A+C)$	
a, B, C				$180°-(B+C)$		
b, A, B						$180°-(A+B)$
b, A, C	$\frac{b\sin A}{\sin B}$		$\frac{b\sin C}{\sin B}$		$180°-(A+C)$	
b, B, C				$180°-(B+C)$		
c, A, B						$180°-(A+B)$
c, A, C	$\frac{c\sin A}{\sin C}$	$\frac{c\sin B}{\sin C}$			$180°-(A+C)$	
c, B, C				$180°-(B+C)$		

Given	$a =$	$b =$	$c =$	$A =$	$C =$	
a, c		$\sqrt{c^2+a^2}$		$\tan^{-1}\frac{a}{c}$	$\tan^{-1}\frac{c}{a}$	
b, c	$\sqrt{b^2-c^2}$			$\cos^{-1}\frac{c}{b}$	$\sin^{-1}\frac{c}{b}$	
a, b			$\sqrt{b^2-a^2}$	$\sin^{-1}\frac{a}{b}$	$\cos^{-1}\frac{a}{b}$	
a, A		$\frac{a}{\sin A}$	$\frac{a}{\tan A}$		$90°-A$	
b, A	$b\sin A$		$b\cos A$		$90°-A$	
c, A	$c\tan A$	$\frac{c}{\cos A}$			$90°-A$	

* $\cos^{-1}$ reads "the angle whose cosine is"

If any angle C is greater than 90° and less than 180°

$\sin C = \cos(C-90)$; $\cos C = -\sin(C-90)$;
$\tan C = -\cot(C-90)$; $\cot C = -\tan(C-90)$.

For any angle, C

$$\sin^2 C+\cos^2 C=1;\ \tan C=\frac{\sin C}{\cos C}$$

$$\cot C=\frac{1}{\tan C}=\frac{\cos C}{\sin C};\ 1+\tan^2 C=\frac{1}{\cos^2 C}$$

$$1+\cot^2 C=\frac{1}{\sin^2 C}.$$

As noted in the lower table above, $\sin A=\frac{a}{b}$; $\cos A=\frac{c}{b}$ While it is true that the above ratios have the values of trigonometric functions, they are not determined in this manner. Trigonometric functions are sums of infinite series.

$$\sin A = A-\frac{A^3}{3!}+\frac{A^5}{5!}-\frac{A^7}{7!}+\cdots\cdots$$

$$\cos A = 1-\frac{A^2}{2!}+\frac{A^4}{4!}-\frac{A^6}{6!}+\frac{A^8}{8!}-\cdots\cdots$$

where A is expressed in radian measure
(1 radian = 180 / π degrees and 1° = 0.017453 radian)
$3!=1\times2\times3$ and $4!=1\times2\times3\times4$, etc.

It is by such series that actual tables of trigonometric functions are constructed.

Abstracted from Bulletin No. 25 of the Southwark Foundry & Machine Co.
A number of other tables are included, particularly for hydraulic determinations

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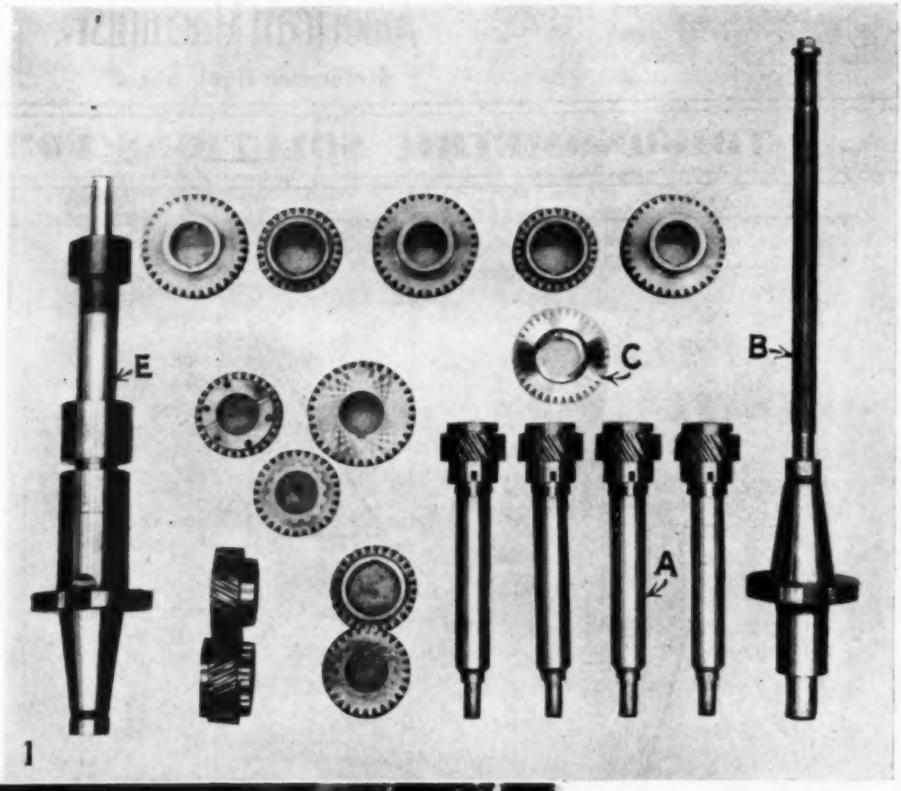
Tooling for a Helical Gearset

ROBERT ABEL
The National Tool Company



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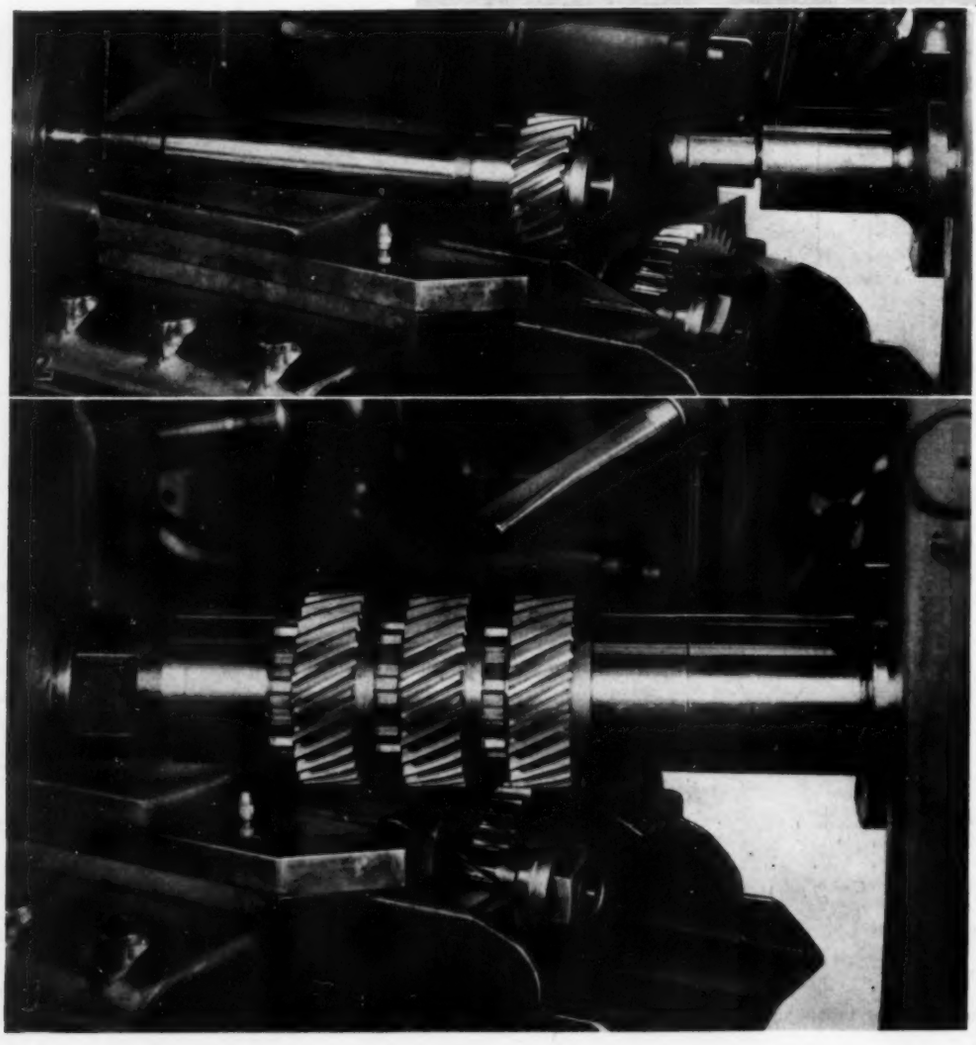

Only one cutter and two arbors are needed to machine all the gears of a modern transmission in a Universal gear shaper

[1] The stem gear *A* is held by the expanding nose of arbor *B*. The remaining gears are mounted on arbor *E* using the proper spacing bushings. Cutter *C* generates the entire set

[2] The overarm center supports one end, and the expanding arbor the other. The stem gear illustrated has a 34-deg. helix angle

[3] Some of the gears may be ganged on the nut arbor. The three shown have a left-hand helix angle. Meshing gears are cut on the same set-up by swivelling the turret for the opposite hand and changing the index gears for the proper number of teeth

AMERICAN MACHINIST

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

New York, September 24, 1931

VOL. 75 No. 13

The Swope Proposal

Comment in the daily press on the plan for industrial stabilization proposed by Gerard Swope has been indicative of the hysteria of the times. Because the plan does not offer a panacea for our industrial troubles, a completely detailed method of avoiding future depressions and solving the employment problem, it has been found disappointing. Another criticism aimed at it is the difficulty of applying it to agriculture and to small business.

If Mr. Swope had endeavored to produce a plan that would encompass all of these points he would have been open to the same criticism which is being visited on the heads of the Soviet Russian scheme, of attempting to leap before one learns to crawl. One of the attractive features of Mr. Swope's plan is that he proposes to have one of our most closely knit, youngest, and most vigorous industries try out this plan to see if it will work. If it should prove to be unworkable the rest of industry and the country as a whole would not be seriously affected. If, on the contrary, this progressive industry should find the plan workable for itself, then other industries would be encouraged to face their own problems with equal candor and apply the same method, or appropriate modifications thereof, to the relief of unemployment, the control of production, and the stabilization of prices. Even agriculture might find some means of rescuing itself from the net in which it is constantly becoming more enmeshed.

Mr. Swope is deserving of high praise for his courage in demanding certain things that are contrary to existing laws, laws that may have been necessary when they were passed but which are possibly no longer suited to existing conditions. He is only saying aloud what many other business men are saying "in confidence" about the anti-trust laws, and he is proposing a means to discover whether business has advanced to the point where intelligence has succeeded cleverness. Possibly he is wrong, perhaps the majority of business men must be clubbed into ethical conduct. At least we should take steps to find out, particularly if those steps lead to an insurance against the unemployment and short time which have been so productive of suffering and discouragement for the past two years.

Until the Fright Is Over

Perhaps this fall, perhaps next spring, perhaps not until 1933 the leaders of national and international thought and action will have discovered the way to allay the universal fear that is paralyzing trade and industry. When that time comes we shall hear no more of trading machine tools for metal or wheat for coffee on the old barter basis, and credit will resume its place in the affairs of the world. Extension of credit depends on restoration of confidence, and the bold planning for the future which we have come to associate with American business rests upon both. That time will come, but in the meantime plant managers must find a way to keep operations going on a scale commensurate with existing markets.

Two interesting and successful experiments show what is possible in the way of adjusting production to demand. The Delaware & Hudson flexible work week, in force in its railroad repair shops, varies from forty to sixty hours with the amount of work to be done. A management with any vision at all can see far enough ahead to scale down toward the minimum limit in time to prevent any accumulation of output and thus keep its men on the payroll. Perhaps some of the equipment industries would find it necessary to set a lower minimum in establishing a flexible working schedule, but even so the assurance that a steady job was his would relieve the employee's mind of the fear that is drawing savings from banks

and hoarding them in socks or safety deposit boxes.

The other experiment is the plan of the Kellogg Company, of Battle Creek, by which a continuous process industry is organized on a basis of four six-hour shifts in place of three eight-hour shifts. The plan has increased the profits of the company even though it has involved employing an extra group of supervisory people and an upward adjustment of hourly rates. Part of the gain is probably attributable to the elimination of an intermission for food in the middle of the shift, with the attendant slackening of activity before and after the intermission.

Many metal manufacturing plants would find it impossible to apply anything approaching continuous operation policies, but they would surely find it profitable to study the advantages of the short continuous shift and to discuss the desirability of it with their employees. In the Skoda Works, in Czecho-Slovakia, a continuous eight-hour shift has been in operation for some time, by vote of the employees.

These two examples are quoted to show that there are ways of surmounting present difficulties. Every plant manager will have to find some way to operate at less than capacity until confidence returns. Even though he may be running full time now, by reason of some such fortuitous circumstance as a new product that has met with public favor, he should be prepared with a plan that can be put into effect if a competing product comes out over night to wrest his market from him.

◂◂ CHIPS ▸▸

One week passes, and we find all industry studying and discussing the Swope plan . . . Mr. Swope will be asked to explain it before the Senate Committee on unemployment insurance . . . Richard Whitney, president of the New York Stock Exchange, warns the world against all such plans for stabilizing business and curing the depression . . . "the law of supply and demand will prevail" . . . he must be selling short in the renewed bear market.

Federal Reserve Board's advisory council urges President Hoover to extend debt holiday . . . Council is formulating plans to assist defunct banks in liquidating and distributing frozen assets to depositors . . . may do something for the real estate bond situation . . . Bids are opened for ten of the eleven destroyers authorized in 1916 . . . fast work . . . Owen D. Young, as spokesman for a national unemployment relief committee, states that the unemployed will not suffer during the coming winter . . . American Bar Association reaffirms its approval of the United States entering the World Court of International Relations . . . Higher taxes and more bonds are on every tongue in Washington . . . Assurance comes that radicals are badly organized . . . Communists and Wobblies never could get along.

COMMUNISM EMERGES AS CAPITALISM

"I have been in a position on my last trip to Russia, in connection with the building of the eight hundred thousand horsepower hydro-electric plant on the Dnieper River, to speak with those in authority. And I not only can repeat that communism has been abolished, but that the Soviets are now operating on a state capitalism basis. Furthermore, eventually the Soviet plan is to swing to a modified system of private capitalism. This is not hearsay but information from the powers that be." —Col. Hugh L. Cooper.

Amercian Chain Company is moving its branch factory from Waterbury to Bridgeport . . . Universal Pictures Corporation cancels pay cuts . . . relieves over fifteen hundred employees and their families . . . Stanolind Pipe Line Company orders thirty-five thousand tons of pipe for loops along its Oklahoma-Indiana line . . . Associated Industries of the State of New York deny that the railroads need rate increase . . . point out to the I.C.C. that they paid dividends of five hundred millions in 1930 and had a surplus of five billion . . . Association for the Advancement of Science in Marketing formed . . . timely.

August metal working moves up . . . index of electrical energy for power purposes steps from 71.7 in July to 73.5 after seasonal adjustments . . . Fifteen per cent increase in first and third class mail in larger cities . . . large amounts of advertising literature . . . sellers seem to be getting tired of just waiting for something to happen . . . Twenty-seven open hearth furnaces in the Youngstown district are operating as against nineteen a week ago . . . Twenty per cent more electrical household appliances are being sold by the public utilities than last year . . . similar increase in appliance energy . . . Westinghouse Electric & Manu-

facturing lands 250,000 dollar order from Commonwealth Edison.

England suspends gold payments on pound sterling . . . Mr. Gandhi, all ninety pounds of him, seems to be giving jitters to the motherland . . . the coalition government is getting a pretty severe initiation into budgets, falling bonds, shaky pounds sterling, fleet mutinies, not to forget East Indian politics . . . Germany, on the other hand, is settling down . . . Ex-Ambassador Gerard seems to think her executives are smart enough to see that she gains by going broke . . . it is all too simple to spend borrowed money and to lend the American credits to Russia that we should be benefiting from ourselves . . . Machinery manufacturers should wake up . . . France lays the ground for resisting plans to extend moratorium . . . Bank of International Settlements warns against inaction on the Wiggin Committee report . . . Japan and China seem headed into a private war . . . Where is the Kellogg anti-war pact?

Indiana Motor Truck begins manufacture of trucks with Cummins Diesel engines . . . Ames Shovel, Hubbard & Co., Wyoming Shovel, Pittsburgh Shovel, Baldwin Tool, and Beall Brothers merge into the seven million dollar Ames Baldwin Wyoming Shovel Company . . . All-welded S.S. "White Flash" launched at Chester . . . Diesel-powered . . . B & O air-conditioned train shows increased traffic of four hundred per cent . . . other railroads hurry their own air-conditioning, now that winter is just around the corner . . . Great Lakes Aircraft works on steam turbine for aircraft . . . 18-8 chrome-nickel steels make flash boiler possible.

THIS WEEK IN *AM*

We have already given you an inkling of how we prepared for the publication of "1,500 Units a Day Accurate to 'tenths'," the first installment of which appears as the leading article today. Now it is no more than fair to reveal that Frank J. Oliver, Associate Editor resident in Chicago, has been in sole editorial charge of the project since its inception. All of us wish to acknowledge the wonderful cooperation given him by Grigsby-Grunow, builders of the Majestic Refrigerator, and in particular by G. S. McKee of that company.

To John M. Carmody we are indebted for his "Men and Machines in Russia" (page 483). Along in March of this year, he was asked temporarily to step out of his normal role as chief editor of "Factory and Industrial Management" and to go to red Russia as special investigator for all the McGraw-Hill Publications. Mr. Carmody confessed some preliminary nervousness about extending his head too far into the Soviet yoke, but he sailed in April. He has been quite safely back in the States only long enough to see his trip in proper perspective and to prepare this exclusive article for *American Machinist*.

• COMING •

If you will think back to last year, you will remember that we had something to say on the subject of "Educational Orders." It was and is our sincere conviction that their adoption as a permanent policy by the Congress and the War Department would bring about two essential results. They would enable our manufacturers to define their tool and production policies for Ordnance materiel. If kept as a cushion for dull times, they would serve as employment stabilizers. To our thinking, the skilled shop executive, the tool-maker and the machinist have all been left out of the calculations for unemployment relief. The stress has been placed on construction and building projects. We need Educational Orders right now.

Since they will again come before the Congress this coming session and the War Department wants them badly, they constitute a live issue. Some manufacturers, being doubtful of their ability to handle such orders, have hesitated to indorse the project. To relieve their minds, we have persuaded Captain Walter Soderholm, of Army Ordnance, to prepare three articles proving that almost every metal-working manufacturer can handle them with little or no difficulty. The first of the series will appear next week, and we bespeak your most careful reading.

In the issue for the following week, do not fail to look for "American Engineers in Russia." Mr. Carmody will cover several important points not touched on in the present issue.

Read also "Punching and Forming in the Strip." Surprising economies result from the adoption of the practice. And then, if you have been looking for a means of securing high test gray iron castings in your own shop, see what the Brackelsberg furnace can do for you.

THE . INDUSTRY .

Progress in Metal-Working and Machinery Markets

AUTOMOTIVE tool sales have increased September totals in some districts, but little change in the all-over situation can be reported. . . . Industrial buying in general is absent; government and municipal business bids fair to follow this example. . . . The state of paralysis that has gripped buyers for the past two years is proving much more difficult to shake off than expected, and the after-Labor-Day upturn still has not materialized. . . . Even inquiries are lacking.

NEW YORK will have some dealers with better September business, but largely on account of some one single order. . . . Detroit's spirits are up, but neither sales nor inquiries have followed, though employment and sales of tools for body work have increased. . . . Automobile purchases have helped market tone in Cleveland, and a school list of 37 tools has been released there. . . . Cincinnati had one manufacturer with an increase in orders and inquiries; others report no change. . . . Buffalo conditions are improving slowly, one dealer having sold two 18-in. lathes and a drill press to three customers who began asking about them eight months ago. . . . If other districts could be lucky enough to close half the outstanding inquiries, the resulting business would almost assume the proportions of a boom. . . . New England has some improvement in industrial schedules, but completion of automotive orders is rapidly being approached.

PHILADELPHIA has only municipal orders, industrial orders and inquiries having declined slightly. . . . Chicago is likewise downhearted with the report that the Board of Education isn't going to purchase the $500,000 worth of tools expected. Milwaukee has had a few automotive and agricultural purchasers and some school business for light gear-millers.

NEW YORK

With several dealers, September will be better than August, but usually as a result of one or two orders and not of any general upward trend. General industrial business is lacking, and even municipal and government business has dropped off. One dealer sold a small lathe, others sold single small items. Nothing has yet been done on either the Subway or Navy lists.

DETROIT

A better spirit prevails in the machinery and machine tool trade, but there is no tangible reason for it yet. Sales are very little better than they were a month or two months ago and inquiries have increased slightly. Tools are being bought by the large automobile manufacturers. Purchases are not heavy and thus far are not significant. Most new tools are for changes in body design. Few changes in motors or in chassis have been heralded, but it is thought likely that such changes are on the way. Employment is picking up.

CLEVELAND

A much better tone prevails in the machinery and machine tool market due to recent purchases by automobile manufacturers and additional inquiries received from this source. Sales were principally for replacement purpose and present inquiries do not indicate any radical changes in body design which would entail retooling on a large scale. The only local feature is the list of 37 items of metal and woodworking tools for the Cleveland Board of Education for three new high schools. Bids for these items will be received Oct. 12.

CINCINNATI

One machine tool manufacturer had a slight gain in sales and inquiries; others received but a dole of business and note no change in market conditions. Selling agents are booking very little, but are having some success in digging up prospects. Most inquiries were from smaller users, whose requirements were but one item.

BUFFALO

Conditions continue to improve slowly. One dealer reported the sale of two 18-in. lathes and a drill press to three customers who began to discuss the subject of purchase nearly eight months ago. One dealer reported a few sales of power transmission equipment during the last fortnight.

NEW ENGLAND

While inquiries have been fairly representative of improving demand, buying continues to drag. Automotive requirements are not clearly anticipated. Chevrolet has been an important buyer, while Ford purchases occasionally, chiefly for the Lincoln model. General Motors also placed some fairly extensive business, which, however, is being rapidly completed. The bearing industry has been favorably affected by automotive orders. The Navy Department closed bids Sept. 22 for turret lathes and a Diesel electric engine plant for the Boston Navy Yard. Some improvement in industrial schedules brightened the outlook. Of chief importance was the resumption of operations at the Underwood plant, Hartford, with better than 2,500 employed.

PHILADELPHIA

No increase in the volume of sales was noted in the last two weeks. Some reported business less than fifty per cent of what it should be, even under the present depression. Inquiries have been almost negligible during the last month. Municipal work has held up better than industrial, and although there have been some sales to contractors having city jobs, they have not been up to the standard desired.

CHICAGO

Evidences of an upturn, while not entirely lacking, are so scant that they may be classed as negligible. Mid-September had been set by optimists as probably the turning point in the business tide, but, with an occasional exception, distributors and manufacturers' representatives report no change. The hope that bids would be asked shortly by the Board of Education on equipment for the Lane Technical High School, roughly estimated at about $500,000, has been shattered by an official order suspending construction on that and other similar institutions. Just when construction will be resumed is problematical, but it will not be before 1932. Inquiries lag, and sales are so infrequent that the closing of an important one is looked upon as an event.

MILWAUKEE

September is showing some improvement over August and more optimism prevails, although none of the factors in the business are predicting any immediate startling changes for the better. A few more and some better-sized orders have brightened the horizon and created better feeling. One manufacturer reports orders for special tools for Detroit automotive plants which include both car and accessory manufacturers. This equipment is undoubtedly to be used in changing designs and models, and if the new cars produced find better sale, additional tool orders are anticipated. Agricultural implements have shown a little life which is reflected locally. Some school business has been placed for light-weight gear-milling machines. One plant has been fairly busy on equipment for government machine shops, particularly aircraft. Added to these are scattered orders from diversified industries which are aggregating a fairly satisfactory volume. If present prospects materialize the predicted fall pickup will become a reality.

WEEK . BY . WEEK

BUSINESS BAROMETER

Trends in General Business throughout the world

THEODORE H. PRICE
Editor, Commerce and Finance, New York

An analogy with a dead-centered machine was to be found in commodity markets. Upon the average, they changed but little. Stocks and bonds dropped lower, though the former took an upward flip on Thursday, while commodities seem to be getting nearer and nearer the irreducible minimum, and they are not, upon the whole, appreciably lower. The decline in investment securities was perhaps an adumbration of the trouble in the English navy reported in the papers of last Wednesday morning. It was said that the crew of at least one warship held a meeting to protest against the reduction in the naval pay that is part of Great Britain's economy program, and that the feeling manifest was so bitter that the senior officers were summoned to London for consultation. Of course, the British navy is the cornerstone of the British Empire, and it is quite natural that any unrest amongst the unlisted men should cause the greatest concern. On the other hand, it should be remembered that unrest in the British navy is not by any means a novelty and that it is unlikely that public opinion will support any attempt to impair the service of which for centuries every Englishman has been proud.

Navy Flare-Up

Ghandi's speeches at the London Conference as well as the advanced position that the Mahatma has taken on behalf of India have also attracted world-wide attention. The seriousness with which they are now regarded has probably been increased by the flare-up in the navy, and the facility in compromise that has been characteristic of most British statesmen will be severely tried in the present emergency. However, it is quite possible that the difficulties in which Great Britain now finds herself have been greatly exaggerated, and that her troubles are not as serious as the scareheads in some of our American newspapers would indicate, despite renewed warnings regarding the stability of sterling.

Of course, it is possible that we may have a further decline in the security markets, but it is well to bear in mind that the buying power of some investors who sold out at or near the top in 1929 is now twice as great as it was two years ago, and that such stocks as Atchison, Topeka & Santa Fe, to take one example, can now be bought at $116 a share, as against $298 a share, which was the high of 1929.

It is possible to draw certain generalizations from historical records, and one of these generalizations is that most standard investments, as well as nearly all the important commodities, have a minimum at which they seem to stabilize themselves no matter how depressing general conditions may be. For this reason it is extremely important to note that most of the commodities that are bought and sold for future delivery in the United States appear to have stopped declining. They go down a little one day, and up the next, but there is no longer any apprehension of a general or ruinous decline, and the number of people who are looking for commodity bargains is rapidly increasing. As usual in such cases the orders given are often below current prices, but as time passes it is quite possible that the limits may be raised, and that we shall see an active business on all the European and American bourses that trade in commodities essential to civilization.

Farmer No Fool

In this connection it is important to observe that the clamor which demanded Federal interference and price stabilization in the commodity markets is gradually becoming less exigent. The Federal Farm Board has now spent or loaned nearly three-fifths of the sum appropriated for it by Congress. Despite this enormous expenditure commodity prices are lower than they were six months ago. The farmer is no fool. He realizes that this sum can only be raised by taxation, of which he will have to pay a part, and that people have no longer the blind faith that they formerly evinced in Uncle Sam's business ability. Therefore, they feel that he had better be kept out of business, and this feeling is so general that the gesticulations of the Louisiana and Texas Legislatures does not make much impression. It presupposes the impossibility of identical action by ten other cotton states.

Taking it all in all the situation in the United States is perhaps better than it has been since New Year's or earlier. Prices are lower, but their effect upon the cost of living is now beginning to be apparent and appreciated. The proposal that the Government should stabilize prices has been tried and found wanting. Further experimentation along this line is, therefore, unlikely.

Distributive trade is better. Many of the chain stores and department stores are reporting an increase in sales over last year, and an enormous fund has been tentatively pledged for the relief of the unemployed during the coming winter. There are some who think that the unemployment has been exaggerated and that the sum provided is larger than will be required. This may be so, but he gives twice who gives quickly in dispensing the relief that is provided for, and there will be but little suffering or privation in the United States during the coming winter. With this assurance, and an abundance of money as indicated by the sale of forty million New York State bonds on a 3.22 basis, the outlook cannot be altogether unsatisfactory.

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THE BUSINESS WEEK

September 23, 1931

Business has had almost as consistently bad breaks from nature and the calendar as it has from statesmen during the past two years . . . Unseasonally hot weather and a late Labor Day have apparently helped make hopes of any pronounced fall upturn fade as we pass the middle of September with no signs of seasonal stimulation in any important line . . . Our index continues to slide off to lower levels, with steel demand and electric power production stagnant and a steady slackening in freight movement and money turnover as measured by check payments . . . Building contracts and coal output alone give faint signs of response to seasonal influences . . . The continued climb of currency outstanding points to an increasingly acute crisis of confidence intensified by the steady weakening of security markets . . . The comparative steadiness of commodity averages is encouraging, but conceals a still unstable price situation . . . The European picture likewise is superficially reassuring but the essential issues are still submerged . . . Persistent inaction in official and financial circles in face of continued uncontrolled deflation becomes increasingly alarming to those who understand the sinister significance of that deflation and the imperative necessity of every emergency effort to stop it.

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Material Trends and Prices . . . .

Lower prices became effective during the week in non-ferrous metals, except aluminum and lead. Fabricated forms, genuine babbitt and scrap reflected the change in raw materials. Steel prices remain inert, although demand appears to have spread out over a greater variety of materials. Transportation continues taking ship plates and line pipe, while shapes and reinforcing material are going actively into construction. With most of the other industries, not much more than inquiries are forthcoming at this time.

(All prices as of Sept. 18, 1931)

IRON AND STEEL

Pig Iron—	Current	Mo. Ago	Yr. Ago
Birmingham, No. 2, Fdry., per gross ton	$12.00	$12.00	$14.00
Buffalo, No. 2, Fdry., per gross ton	17.00	17.00	15.90
Heavy Melting Steel Scrap— Pittsburgh consuming point, No. 1, per gross ton	10.50	10.50	15.60
Furnace Coke—Connellsville, per net ton	2.40	2.40	2.60
Foundry Coke—Connellsville, per net ton	3.25	3.25	3.50
Steel Shapes—Pittsburgh, base, per 100 lb	1.60	1.60	1.60

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Iron Machinery Castings—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight, 275 lb:

Chicago....4.62½ Cleveland....4.50 New York....4.75
Cincinnati....4.40 Detroit....4.00

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Steel Sheets—Prices in cents per lb., del. from warehouse stock (except at Pittsburgh) in lots of 401 to 999 lb., ordered and released for shipment at one time:

	Pitts. Mill	Chicago	Cleveland	New York
Blue annealed, No. 10*	1.85	3.20	3.00	3.40
Black sheets, No. 24	2.40	3.55	3.60	3.50
Galvanized, No. 24	2.90	4.10	4.00	4.00

* Light plates.

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Seamless Steel Tubing—Cold-drawn mechanical tubing round, .10 to .30 carbon, in lots of less than 100 ft. or 100 lb., net, at N. Y. warehouse:

Thickness of Wall		Outside Dia. in Inches						
		⅛	¼	⅜	½	1	1¼	1½
Inches	B.w.g.	Price per Foot						
.035	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23

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Shapes, Plates, Bars, Etc.—Warehouse base prices in cents per lb., del. in lots of 401 to 999 lb., ordered and released for shipment at one time:

	New York	Cleveland	Chicago
Bands	3.40	3.00	2.95
Bars, soft steel	3.10	2.75	2.75
Cold fin., flat or square	3.90	3.60	3.60
Cold fin., round or hexagon	3.40	3.10	3.10
Cold rolled strips	4.95	6.00	5.50
Floor plates	4.85	5.00	5.00
Hoops	3.75	3.65	3.50
Rivets	4.00	4.00	4.00
Shapes	3.10	2.95	3.00
Spring steel	4.00	4.00	4.00
Tank plates	3.10	2.95	3.00

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Stainless Steel—Hot-rolled bars, base, Pittsburgh. 0.12 per cent carbon, cents per lb:

Chromium		Chromium	
15% and under	19.00	18 to 23%	23.00
15 to 18%	20.50	23 to 30%	28.00

Bolts and Nuts—Discount from list, f.o.b. mills, Birmingham Chicago, Cleveland and Pittsburgh, on machine bolts, all sizes, cut thread; nuts, hot-pressed or cold punched; and lag screws, mill lots 73-10%

NON-FERROUS METALS

Prices following are in cents per lb. for mill shipments in carlots:	
Aluminum ingots, 99%, N. Y.	23.30
Copper, electrolytic, Conn	7.25
Copper wire, base, Chicago and Cleveland	9.62½
Copper wire, base, N. Y.	9.50
Lead, pigs, E. St. Louis	4.22½
Tin, Straits, pigs, spot, N. Y.	25.00
Zinc, slabs, E. St. Louis	3.75
Prices following are in cents per lb., base, N. Y., Chi. and Cleve:	
Brass rods, high	13.25
Brass sheets, high	15.00
Brass tubing, high	19.75
Copper, drawn round	15.62½
Copper sheets	17.12½
Copper tubing	19.62½
Prices following are in cents per lb., del. from N. Y. warehouse:	
Babbitt, anti-friction, general service	29.00
Babbitt, com'l, intermediate grade	34.75
Babbitt, genuine, highest grade	44.00
Solder, bar	19.87½
Prices following are in cents per lb., base, Huntington, W. Va:	
Monel metal rods, hot rolled	35.00
Monel metal sheets, full finished	42.00
Monel metal tubing, seamless	65.00
Nickel rods, hot rolled	45.00
Nickel sheets, full finished	52.00
Nickel tubing, seamless	75.00

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Scrap Non-Ferrous Metals—Dealers' purchasing prices in cents per lb., f.o.b. cars:

	New York	Cleveland	Chicago
Heavy yellow brass	2.75	4.25	4.00@4.25
Light brass	2.25	3.25	3.25@3.75
No. 1 rod-brass turnings	3.25	4.50	4.00@4.50
Heavy copper	5.50	5.75	6.25@6.75
Light copper	4.50	5.00	5.50@6.00

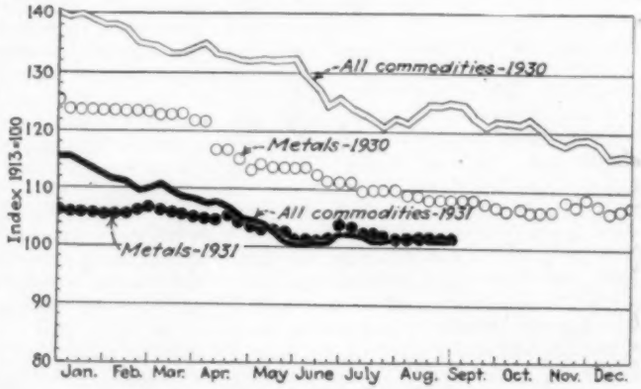
SHOP SUPPLIES

(Prices at warehouse)	New York	Cleveland	Chicago
Abrasive disks, aluminum oxide mineral, cloth, 6-in. dia., No. 1, less than 200, per 100	$4.36	$4.59	$4.59
Belting, leather, heavy, discount	30-10%	40%	40%
Belting, rubber, trans., 1st grade, discount	60-10-10%	60-10%	60%

Lumber—Per M ft., b.m., 12-16 ft. lengths, del., N. Y:

Crating—Southern pine:
1x4-in. ..... $20.00 1x6-in. $22.00

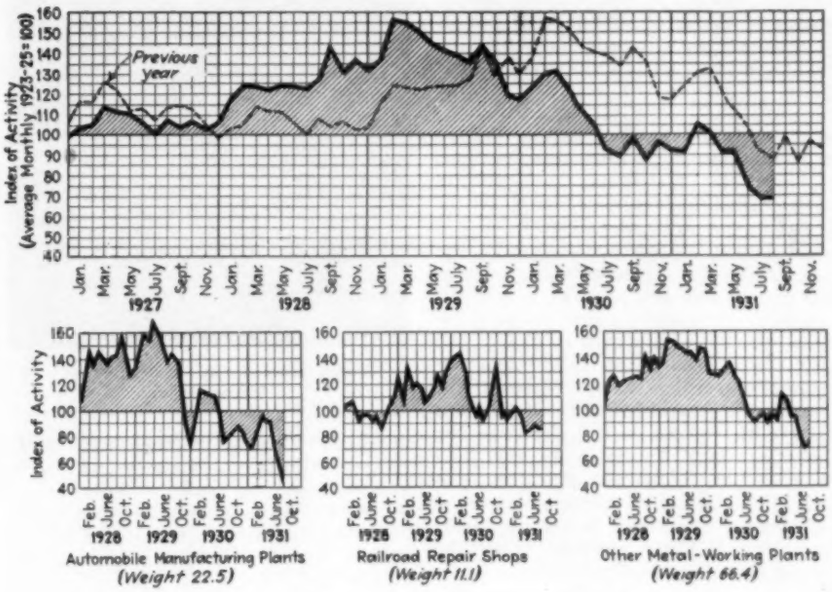
Skids—Spruce:
2x4-in. .$32.00 3x4-in. .$33.00 4x6-in. .$35.00 6x6-in. .$38.00



Price Indexes Week by Week

(6 Metals and 74 Commodities—Figures from The Annalist.)

NEWS



August Metal-Working Operations Hold About Even

Reports on the consumption of electrical energy for power purposes show that industrial activity held at the July level during August. The final figure of 100.3, in March, 92.4 in April, 92.6 in May, 78.2 in June and 68.0 in July, remained at 68 for August. These figures are all adjusted for 26 working days, as are subsequent ones.

The automobile shop index, 94.1 for March, 90.8 for April, 91.5 for May, 71.3 for June and 55.9 for July declined to 43.6 in August. The railroad repair shop index, 94.3 for March, 82.8 for April, 84.7 for May, 89.2 for June and 84.3 for July showed a slight rise to 85.5 in August. Ferrous and nonferrous metal-working plants outside these two groups had an August index of 73.3 as compared with a July index of 69.3, a June figure of 78.6, a May index of 94.1, April index of 94.6 and March index of 100.5.

When the figures are adjusted seasonally several point revisions occur. The railroad repair shop index rises to 96.2 from 85.5, the metal-working index rises to 79.3 from 73.3, and the automobile index rises to 45.3 from 43.6. These figures compare with railroad repair shop seasonally adjusted indexes of 92 in July, 96 in June, 92.5 in May, 80.1 in April and 90.3 in March; automobile figures of 56.3 in July, 69.8 in June, 78 in May, 76 in April and 88.2 in March, and "other metal-working" figures of 73.5 in July, 82.8 in June, 91.7 in May, 92.4 in April and 95.3 in March. These give a seasonally adjusted figure for the entire group of 73.5, up 2 points from the 71.7 of July, but below the 81.4 of June, 87.3 of May, 87.9 of April and 92.9 of March.

Machinery Dividends

Dividends paid by manufacturers of machinery in August, amounted to $2,655,824, according to the Standard Statistics Co., New York. Total cash dividend payments of domestic corporations in August were $211,543,796.

Second Quarter Earnings Better Than First

Aggregate earnings of 260 representative industrial corporations in the second quarter of 1931 were 28.70 per cent higher than in the first quarter, according to compilations of published reports announced by Ernst & Ernst, accountants. This compares with an increase of 9.86 per cent for the same companies as between the first and second quarters of 1930, and an increase of 25.72 per cent between the same two quarters of 1929. In recent years the increase of second-quarter over first-quarter earnings has averaged around 20 per cent. Another compilation showing six-months' earnings of 928 corporations, including 526 industrials, 171 railroads, 103 telephone companies, 90 other public utilities, and 38 finance companies other than banks showing aggregate earnings of $1,029,998,912, as compared with $1,625,890,327 for the first six months of 1930, a decrease of 36.65 per cent this year under last year. Of the 526 industrials whose six-months' earnings have been reported, one-fourth, or 131, made more profit this year than last, while three-fourths, or 395, made less. Machinery and tools showed a 61.59 per cent decline in operating income and sundry metal products a decline of 77.42 per cent, while iron and steel showed a decline of 87.35 per cent, all over last year.

Auto Plants Lead In Five-Day Week

A five-day week has been put into operation as a temporary measure by 44.3 per cent of the automobile industry, according to a survey on the growth of the movement for shorter working weeks, included in the monthly review issued by the Bureau of Labor Statistics, Department of Labor. This compared with an average of 5.6 per cent for 37,857 establishments, representing 77 industries and employing about 3,941,792 persons. Three industries using highly skilled craftsmen ranked in order below automobile manufacturers. In the radio industry, 34.4 per cent of the workers were on a five-day week, in textile dyeing and finishing, 27 per cent, and in the aircraft industry, 24.9 per cent. Meanwhile automobile output continues to sag, getting down to 45.3 for the week ended Sept. 12, against 46.7 for the preceding week and 63.1 for the corresponding week of last year. Hopes for a larger aggregate motor car output in the next few weeks now appear to rest with the Ford Motor Car Co.

Freight Loading Declines

Loading of revenue freight for the week ended Sept. 5 totaled 759,546 cars, according to a recent announcement of the Car Service Division of the American Railway Association. This was a reduction of 4,218 cars below the preceding week and a decrease of 97,103 cars below the loading of revenue freight for the corresponding week last year. It was also 258,935 cars under the same week two years ago.

N.M.T.B.A. Directors Meet at Madison

Directors of the National Tool Builders' Association held a meeting Sept. 11 at Madison, Wis., as guests of CARL A. JOHNSON, president of the Gisholt Machine Co., Madison, and head of the association. A business session was held in Mr. Johnson's home during the afternoon, following an automobile tour of the city and a visit to the Gisholt and other local plants. Madison was selected for the meeting in honor of Mr. Johnson. In attendance were ROBERT M. GAYLORD, president, Ingersoll Milling Machine Co.; C. R. BURT, president, Pratt & Whitney Co.; G. E. RANDLES, president, The Foote-Burt Co.; FREDERICK V. GEIER, vice-president, Cincinnati Milling Machine Co.; HENRY S. BEAL, assistant general manager, Jones & Lamson Machine Co.; FRED H. CHAPIN, president, The National Acme Co.; RICHARD A. HEALD, president, The Heald Machine Co.; E. F. DUBRUL, general manager, and MRS. FRIEDA F. SELBERT, of the general offices in Cincinnati.

Conference on Metals and Alloys

In an endeavor to bring together executives and engineers for the consideration of certain phases of engineering progress, Case School of Applied Science and The Cleveland Engineering Society last year started a series of Educational Industrial Conferences, held at Case, at which papers are presented by capable speakers followed by a general discussion of the subject by those interested. The intention is to acquaint those active in engineering and manufacturing development with the latest progress in some particular field in the hope that application of such knowledge will be stimulated.

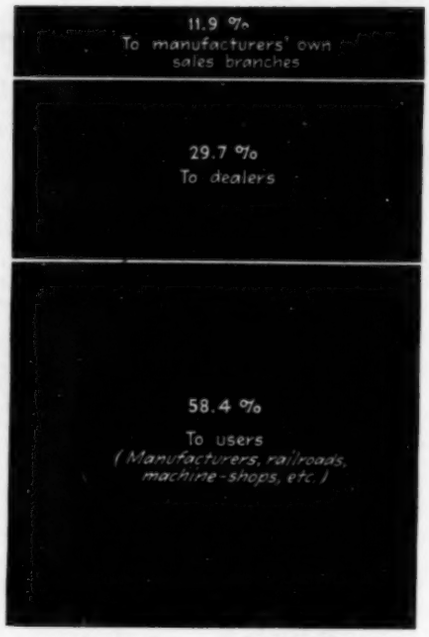
In the Spring of 1931, three conferences were held—on Highways, Welding, and Electrical Control in Industry. Plans for the academic year 1931 - 1932, include conferences on Metals and Alloys, Air Conditioning, and Industrial Fuels. The conference on Metals and Alloys will be held in November, the Air-Conditioning Conference in January, and the Industrial Fuels conference in March. The Metals and Alloys conference is scheduled for Nov. 18, 19 and 20, and is arranged to appeal to three groups: Architects and structural engineers; power and process engineers, and design and product engineers. There will be overlapping of interests in the various groups, and an effort will be made to bring common interests together on the program. Demonstrations and exhibits of specimens and equipment will also be conducted in the laboratories, including complete die-casting process with physical tests, and X-ray examination; welding of special alloys; architectural and structural alloys; physical and metallurgical tests on and exhibits of lightweight alloys, stainless steels, "Monel Metal," "brass," "nickel silver," etc., and exhibits of alloys with special properties for endurance, corrosion, resistance, wear and hardness.

Distribution in 1929 Of Machine Tool Sales

More than half of the sales by manufacturing plants engaged primarily in making machine tools are made to users, such as manufacturers, railroads, and machine shops. According to data collected by the Census of Distribution, of the total sales by the manufacturing plants in the machine tool industry in 1929, amounting to $240,273,000, 58.4 per cent, or $140,290,000, was sold in this way. Manufacturing plants sold 11.9 per cent, or $28,639,000 worth of goods to their own sales branches for resale to dealers and users. The remaining 29.7 per cent, or $71,344,000, was sold to dealers. Of these sales to dealers and users, $38,301,000 was made through manufacturers' agents, selling agents, brokers, or commission houses by 80 manufacturing plants employing such agencies, 18 of which sold their entire output in this way. The total sales are $4,305,000 less than the value of products as reported by the Census of Manufactures. This difference is explained by the facts that contract work amounting to $5,414,000 is included in the value of products, but not under power and demonstrated by expert mechanics. Unusual attention was also focussed in the plant of Cincinnati Grinders, Inc., on a grinding machine under construction which is one of the largest machines of its type ever constructed and which when completed will grind work to within limits of two ten thousandths of an inch. Prior to the inspection trip, dinner was served to the guests at the Milling Machine plant and P. O. GEIER, treasurer, welcomed the visitors on behalf of the organization. T. J. COOK of Dayton, works manager of General Motors Radio Corp. and vice-president of the Foremen's Club, expressed his appreciation for the club members.

550 Foremen Visit Cincinnati Milling

Journeying from Dayton, Ohio, under the auspices of the Dayton Foremen's Club, 550 industrialists on the evening of Sept. 11 inspected the plants of The Cincinnati Milling Machine Co., Cincinnati Grinders, Inc., and Foundry Division, Cincinnati. Both plants were under complete operation for the visitors. Of special interest was the machine tool laboratory of the Milling Machine Company, containing 24 modern milling and grinding machines, all



Distribution of machine-tool factory sales

in sales, whereas jobbing ($584,000) and net sales from inventory ($525,000) are included in sales. This report shows the sales channels used by the 280 manufacturing plants engaged primarily in making power-driven machines for cutting or shaping metals. Machine tools manufactured in this industry are designed for more or less general use, as distinct from machines designed for manufacturing special articles. Plants making portable hand tools for calking, riveting, and driving screws are also included. The sale of other products, such as parts and attachments, made by the machine tool industry, are also included. Statistics giving the number and value of products, as well as other facts on the industry, may be found in the preliminary report issued by the Census of Manufactures under date of Oct. 1, of last year, a copy of which will be furnished upon request to the Census Bureau.

Seven and a Half Years Without Accident

The Navy has added two records to its credit in safety engineering. One was established by the Navy Yard, Cavite, P. I., where the patternmakers and foundry workers, which include the chippers and grinders, have worked seven and a half years without an accident which necessitated loss of time by any employee. The total number of working hours during that period was 1,550,000. Five Naval Air Stations made a record during May, 1931. The air stations at Lakehurst, Pensacola, San Diego, Hampton Roads and Coco Solo, employing a total of 2,203 men, worked 427,000 man-hours without a lost-time accident.

Germany Losing Ground in Russian Business

By Our Berlin Correspondent

The general position of the German machinery industry continues to become worse. Official reports of the VDMA state that working hours during May, June and July decreased from 44.7 to 43, and further to 42.8 per cent of their normal duration. Domestic orders are few, since other metal- and wood-working industries are in just as bad a position, and foreign countries scarcely even send inquiries. In a late address of the German prime minister, the general situation was fully gone into, and, for the revival of industrial work, administrative measures in banking and credit affairs were discussed. This is of prime importance, especially for the German machinery industry, since here the position is such that, through excessive concentration of the large banks after the war, large works were supplied with sufficient funds, but not the smaller ones. While on the one hand, medium and small works constitute 95 per cent of the entire German machinery industry, on the other hand the upkeep of the German machinery industry never was so dependent on credit grants as at present. At the present time Russian orders amounting to about 170 million dollars are still to be filled by German industry. However, under the pressure of the specially bad economic conditions in Germany, Russia now demands an usance of 24 months for its bills. Quite a number of German industrial firms have therefore been obliged to return Russian orders, because their financing did not appear secure enough. Under these circumstances nothing was easier for the American, English, Italian and Swiss machine factories than to eliminate Germany from the market.

England especially is making enormous efforts to obtain Russian business, as quite lately the British Government has decided to provide further £6,000,000 for the insurance of British deliveries to the U.S.S.R., according to a statement of the Trade Minister Graham in the House of Commons. Of particular importance is the fact that up to 2½ years' credit may be granted, while with former Russian orders only credits up to 12 months were insured, and thus made negotiable, by the British Government. This new decision bears a certain danger for other countries besides Germany.

It is known that usually so-called "contracts for technical assistance" are connected with deliveries of large machine plants to the U.S.S.R. Since the British machinery industry is suffering especially under the unemployment problem, English engineers, technicians, foremen and other specialists naturally offer their services at a fraction of the wages demanded, for instance, by Americans. The natural consequence will be a strong British influence on the development of growing Russia, and a pro-British attitude of Russian science and industry. However, from the Franco-Russian trade negotiations one may conclude that orders are being placed in France; also the recently terminated trip to Russia of Italian industrialists of greatest influence, accompanied by the leading heads of Italian banks and financial institutes, to study the questions of credits and financing on the spot, gives occasion for thought. It must never be forgotten that the present deliveries to Russia are a one-time matter only. Once the 5-year plan and industrialization of Russia have been brought to an end—and the Russian advances show that this is not questionable any longer, but only a matter of time—the placing of orders will end in any case, and Russia as a market for foreign products will be closed. Indeed, one must further consider that, after complete industrialization in a relatively short time, Russian dumping will probably commence, as done now already on the world markets for timber.

If in the aforesaid the difficult position of Germany in Russia, caused by its financial paralyzation, has been explained, this represents only part of the difficulties to be experienced by Germans in the East. Poland, up to now also a good customer for German products, has prepared a new customs tariff, already submitted to the Chambers of Commerce and Industry for their opinion, and whose character is entirely protective. Some of the items have been raised to the two- to three-fold of the former rates. Well-informed parties consider that this new tariff will only be put in force in about six or nine months, and it therefore seems advisable to remark that this period should be taken advantage of to import goods into Poland at the old rates.

Machinery Imports of U.S.S.R.

Kind of Machinery	Year (Oct.-Sept.)	Total	From U. S.	From Germany	From Great Britain
Machines and machine parts. Total	1925/26	54,070	14,260	21,580	6,488
	1926/27	55,220	10,050	28,820	9,300
	1927/28	73,580	15,370	41,780	6,191
	1928/29	76,910	22,560	32,610	6,369
	1929/30	177,050	88,950	54,740	10,058
A detailed classification according to kinds of machinery with the share of each country cannot be given. The export statistic of the USSR only mentions "Agricultural machinery" and "Tractors." All other machines are included in the group of "Other machines."					
Agricultural machinery including tractors and parts	1925/26 (1)	22,080	7,720	7,260	316
	1926/27 (1)	10,790	5,110	3,080	73
	1927/28	12,660	7,170	2,900	68
	1928/29	24,370	14,730	5,780	29
	1929/30	62,450	47,950	8,870	378
Thereof: tractors and parts	1925/26	For these years tractors and parts were not yet separately classified.			
	1926/27				
	1927/28	5,375	5,140	136	29
	1928/29	12,080	11,180	486	15
	1929/30	40,250	36,200	1,145	311
Other machines and appliances (without electrical) including parts	1925/26 (2)	31,990	6,540	14,320	6,172
	1926/27 (2)	44,390	4,940	25,740	9,227
	1927/28	60,920	8,200	38,880	6,123
	1928/29	52,540	7,830	26,830	6,340
	1929/30	114,600	41,000	45,870	9,680

(1) In the years 1925/26 and 1926/27 parts of agricultural machinery were included in the group "Other machines and appliances including parts."

(2) In this group parts of agricultural machinery are included for the years 1925/26 and 1926/27.

Of the total Russian machinery imports, agricultural machinery represented 17% in the year 1927/28, 32% in the year 1928/29, and 35% in the year 1929/30 (including tractors). A classification of the "Other machines and appliances" as to countries of origin is not possible.

During the year 1927/28 the total machinery imports increased by about 35% compared to those of the previous two years, and by about 130% (i.e. up to more than twice as much) during the year 1929/30, compared to 1927/29.

The import of agricultural machinery has duplicated during the year 1928/29, compared to the year before (including tractors). During the year 1929/30 it has risen still more, i.e. by 160%, compared to 1928/29.

Import of "Other machines and appliances" was 14% less in 1928/29 than during the year before, but in 1929/30 increased by 120% compared to 1928/29.

The percentage share of the chief countries of import of machines, of the U.S.S.R., developed as follows:

Percentage share of import of	Year	U. S. A. Per Cent	Germany Per Cent	Great Britain Per Cent	Other Countries
Agricultural machinery and tractors	1925/26	35	33	1.5	30.5
	1926/27	47	29	0.7	23.3
	1927/28	56	23	0.6	20.4
	1928/29	61	24	0.1	14.9
	1929/30	77	14	0.6	8.4
Other machines and appliances	1925/26	20	45	19	16
	1926/27	11	58	21	10
	1927/28	13	64	10	13
	1928/29	15	51	12	22
	1929/30	36	40	8	16
Machines, total	1925/26	26	40	12	22
	1926/27	18	52	17	13
	1927/28	21	57	8.5	13.5
	1928/29	29	42	8.5	20.5
	1929/30	50	31	6	13

Seven Concerns Bid On Ten Destroyers

Bids for the construction of ten of the eleven 35-knot destroyers authorized in 1916, appropriations for beginning the construction of which were made by the last Congress, were opened at the Navy Department Sept. 16. Only the bids of private shipyards were made public. The bids of the navy yards, because of difference in the estimating of costs, will be made public later. Bids are for hull and machinery only and include those submitted by the Bath Iron Works Corp., Bethlehem Shipbuilding Corp., Maryland Drydock Co., Newport News Shipbuilding & Drydock Co., New York Shipbuilding Co., Pusey & Jones Corp., and United Dry Docks, Inc. Ordnance equipment probably will cost about $1,500,000 for each vessel, in addition to the figures for building the ships, which range from $2,380,000 to $3,804,000 each.

Lighting Meeting

All phases of illumination for any purposes will be discussed at the Silver Anniversary Convention of the Illuminating Engineering Society, to be held at the Hotel William Penn, Pittsburgh, Pa., from Oct. 12-16.

BUSINESS ITEMS

Arthur A. Crafts & Co., manufacturers of diamond and tungsten-carbide tools, have moved their Boston plant and offices from 125 Summer St. to 161 Brookline Ave., where enlarged quarters are available. The new plant has about 12,000 sq.ft. of space where additional machinery and laboratory equipment will be set up and put into operation. Except in a few special cases, all machine tools will be individually motored. Other plants and sales-service units in Chicago and Detroit will continue as before.

The Kester Solder Co. has established and opened a plant at Brantford, Canada, under the name of the Kester Solder Co. of Canada, Ltd. The entire line of the company will be manufactured in the Brantford plant, in addition to the other plants in Chicago and Newark.

The Stanolind Pipe Line Co., owned by the Standard Oil Co. of Indiana, has placed orders for 35,000 tons of pipe for the construction of loops along its trunk line from Healdton, Okla., to Whiting, Ind. Orders are understood to have been distributed among the A. O. Smith Corp., the Youngstown Sheet & Tube Co., the Republic Steel Corp., Spang Chalfant & Co., Inc., and the National Tube Co.

The Balzer Machinery Co., Portland, Ore., has been appointed agent of the Marion Steam Shovel Co., Marion, Ohio, for the states of Oregon, Washington, Idaho, Montana, and northern Wyoming and northern California. A stock of repair parts will be carried in the Portland warehouse. R. L. BALZER is manager.

The Heald Machine Co. has appointed Hahn & Kolb, Stuttgart, in South Germany, George Stenzel & Co., Berlin, in Northern Germany, and Ernst Rehm in Bavaria, as temporary representatives. FRANZ E. WARSOW is also acting as a direct representative in Germany.

American Chain Co., Bridgeport, Conn., is moving its branch factory at Waterbury to Bridgeport. Improved production and certain economies are expected to result. The Waterbury plant was formerly operated under the name, Andrew C. Campbell, Inc.

The Pennslyvania Pump & Compressor Co., Easton, Pa., has formed a connection with Byer Engineering Associates, of the same city, with branch offices at 136 Liberty St., New York, and 1328 Chestnut St., Philadelphia.

Headquarters of the General Welding Co., Houston, Texas, formerly at 2418 Polk St., have been moved to 2607 Polk Ave., with a considerable enlargement in floor space.

PERSONALS

DEXTER KIMBALL, dean of engineering, Cornell University, has been made chairman of the board, Alexander Hamilton Institute, New York City.

T. E. BARKER, president of the Accurate Steel Treating Co., Chicago, spoke on "Tool Treatment and Tool Design—Their Correlation" at the the open meeting of the Chicago chapter, A.S.S.T., Sept. 10. C. B. SADTLER, metallurgist for the Barber-Colman Co., Rockford, Ill., spoke on "The Heat-Treatment of High-Speed Steel Tools."

MYRON BIRD of the California Saw Works is chairman of the Golden Gate chapter, A.S.S.T., which will hold regular monthly meetings alternately in San Francisco and Oakland, Calif.

A. G. BRADBURY, formerly in charge of the Detroit office of International Derrick & Equipment Co., in the General Motors Bldg., which last May was merged to form International-Stacey Corp., is division manager of the Michigan division. Headquarters of International-Stacey Corp., have been moved from Jackson, Mich., to 501 Stephensen Bldg., Detroit.

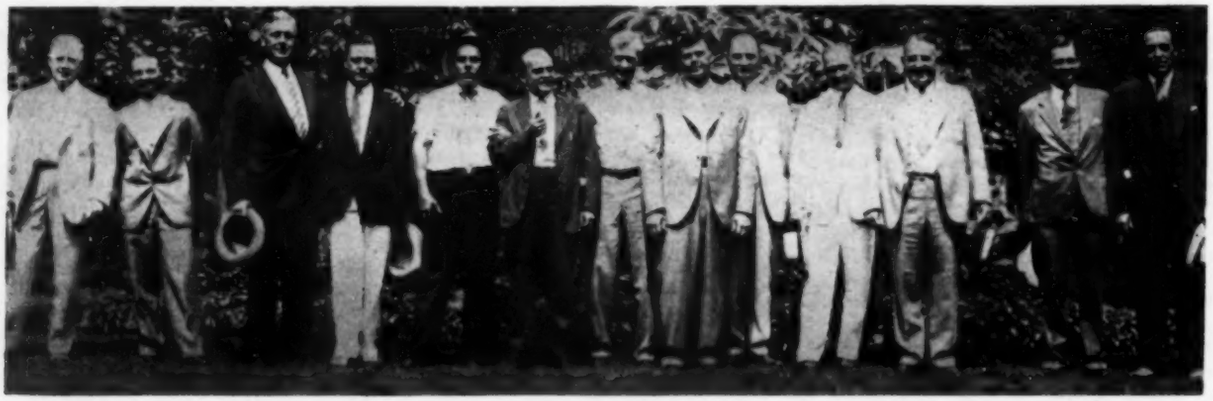
W. C. BUCHANAN, vice-president of the Keystone Steel & Wire Co., Peoria, Ill., has been made a member of the company's board of directors.

JAMES A. CARRUTHERS, connected with the purchasing department, American Steel Foundries, Chicago, for the last 27 years, resigned Sept. 1.

L. S. CATES, New York, president of the Phelps Dodge Corp., has returned from a trip to Europe.

KENT S. CLOW, president of James B. Clow & Sons; GEORGE E. SCOTT, president of the American Steel Foundries, and MAX EPSTEIN, chairman of the board of the General American Tank Car Corp., all of Chicago, are among those appointed members of the special gifts division of the Chicago emergency unemployment relief campaign.

V. P. RUMELY has been appointed factory manager of the Hudson Motor Co., Detroit.



The Welding Section, National Electrical Manufacturers' Ass'n, met recently at Niagara Falls, affording this unusual opportunity for photographing representatives of many manufacturers of arc-welding equipment. Left to right: JACK AMOS, Hollup Corporation, F. E. HALL, USL Battery Corporation, J. F. LINCOLN, Lincoln Electric Co., L. P. HUME, General Electric Co., C. J. HOLSLAG, Electric Arc Cutting & Welding Co., E. W. KRONBACH, Una Welding & Bonding Co., W. W. REDDIE, Westinghouse Electric & Mfg. Co., L. D. MEEKER, General Electric Co., D. H. KELLY, USL Battery Corporation, E. D. BRANSOME, Wilson Welder & Metals Co., A. A. MACLEAN, USL Battery Corporation, O. F. STROMAN, Westinghouse Electric & Mfg. Co., J. L. FOSNIGHT, USL.

C. B. COLDWELL, formerly of the Chicago office, International-Stacey Corp., Columbus, has been transferred to the Fort Worth, Texas office at 1309 Aviation Bldg.

A. T. SIMONDS, president of the Simonds Saw & Steel Co., Fitchburg, Mass., was the guest of the Springfield (Mass.) chapter of the National Association of Cost Accountants Sept. 9.

DR. EMIL EBERHARDT, German research chemist, is engaged in research work in the laboratories of the U. S. Reduction Co., East Chicago, Ind., in conjunction with the company's research chemists, in order to develop new alloys for the airplane industry.

DR. H. L. FREVERT has been elected president of the Midvale Co. to succeed the late ALVA C. DINKEY. FRANCIS BRADLEY, formerly general superintendent, has been elected vice-president to succeed Dr. Frevert.

B. B. GREER has resigned as president and director of the New York Air Brake Co., New York City, and has been succeeded by LOWELL R. BURCH, who has been acting as chairman of the executive committee.

LLOYD JONES, manager of the Salem (Ohio) works of the E. W. Bliss Co., Brooklyn, N. Y., sailed recently for Europe on a business trip.

W. KENNETT, in charge of the Societe Anonyme Alfred Herbert, Paris, and J. BLAIR of Alfred Herbert, Coventry, England, are visiting various manufacturing plants in the United States.

R. B. KITE has been appointed manager of the Philadelphia territory for Robbins & Myers Inc., Springfield, Ohio, Hoist & Crane Division. His headquarters will be at 401 North Broad St., Philadelphia.

RUSSELL KOENITZER has been appointed representative in the Detroit-Cleveland territory by the Belden Mfg. Co., Chicago, Ill. He has been with the company for over seven years in the production, sales and service, and advertising divisions.

C. W. MAYER, manager of the Indianapolis branch, Crucible Steel Co. of America, New York City, has retired but will continue to act in a consultative capacity. ROY SLAUGHTER has been appointed Indianapolis manager to succeed Mr. Mayer.

CHARLES T. MILLS, director of the chrome alloy department, General Alloys Co., Boston, has resigned to become chief engineer of Empire Steel Castings, Inc., Reading, Pa. He was for many years chief engineer of the Duraloy Co., Pittsburgh.

ERNEST L. RICHTER, industrial engineer, formerly with the Trundle Engineering Co., Cleveland, and later with National Lamp Works of General Electric Co., Cleveland, has organized Richter Engineers, with offices at 1117 Schofield Bldg., that city. Associated with Mr. Richter is KENNETH W. REED, industrial and mechanical engineer, formerly consulting engineer for the Warner & Swasey Co., Cleveland.

D. A. NEMSER, chief metallurgist of Pratt & Whitney Co., Hartford, Conn., spoke at a meeting of the New Haven chapter, A.S.S.T., Sept. 17, at the Hammond Laboratory of Yale University. His subject was "High-Speed Steel."

STEFHAN SCHONBRENNER, a member of the organization of Kocian & Nedela, Czechoslovakian agents for the Heald Machine Co., is in this country studying the manufacturing, assembling, and operating of Heald machines. Mr. Schonbrenner will act as special sales representative in Poland for Kocian & Nedela upon his return.

E. J. SLOAN, a director of the Cushman Chuck Co., Hartford, Conn., was elected vice-president at the annual meeting.

B. E. STONE has retired as general purchasing agent of the American Steel & Wire Co., after 41 years as an employee of the company and predecessor plants. He has reached the retirement age under the pension rule of the United States Steel Corp., of which American Steel & Wire is a subsidiary. J. M. FLEMING has succeeded Mr. Stone, with the title of purchasing agent. He has been connected with the company since its organization. F. E. CHESNEY, formerly with the purchasing department, in Chicago, and for the past two years with the Cleveland department, has been named assistant purchasing agent. D. D. MACDONALD has been named district purchasing agent with offices at 94 Grove St., Worcester, Mass.

MYRON C. TAYLOR, chairman of the finance committee, United States Steel Corp., New York, has been elected a member of the executive committee of the New York Central railroad to succeed the late GEORGE F. BAKER.

FRITZ THYSSEN, of Thyssen & Co., Berlin, Germany, steel leader and a foremost figure in the economic circles of Germany, will speak Oct. 21 at the friendship dinner in the new Waldorf-Astoria Hotel, New York, which will mark the close of the Eighth conference of major industries. The dinner will be under the joint auspices of Columbia University, the Chamber of Commerce of the State of New York, the Merchants' Association of New York and the Institute of American Meat Packers. Members of the board of honorary chairmen are: THOMAS A. EDISON, HENRY FORD, CYRUS H. K. CURTIS, JULIUS ROSENWALD, OWEN D. YOUNG, ORVILLE WRIGHT, ADOLPH S. OCHS, THOMAS W. LAMONT, GEORGE EASTMAN, CHARLES M. SCHWAB and HARVEY S. FIRESTONE.

OBITUARIES

CLARENCE W. AIRD, 57, organizer of the Brantford Oven & Rack Co., Ltd., Brantford, Ont., from which he retired as manager in 1927, died recently.

A. D. QUINN, 44, sales manager of the Industrial Division, L. H. Gilmer Co., Philadelphia, died suddenly Sept. 17 while on a business trip to Chicago.

WILLIAM J. GLEASNER, 56, president of the Gleasner Compressed Air Supply & Equipment Co., Buffalo, died recently as the result of an accident.

SIR HOWARD GRUBB, 87, who developed the periscope and was an authority on astronomical instruments, died in Dublin, Ireland, Sept. 16. He had been engaged of late in determining the possibilities of naval range-finder sighting apparatus for quick-firing guns.

DAVID O. RICHARDS, 59, of Louis E. Emerman & Co., machinery dealers of Chicago, died at Chicago, Sept. 12. He had been connected with the machine-tool industry for the past 30 years.

BURCHARD THOENS, 79, inventor of refrigeration machines and retired consulting engineer, died Sept. 17 at his home in New York City, after an illness of several months.

JOHN H. STAPLES, 58, owner of the J. H. Staples Foundry Co., Mt. Vernon, Ind., died Sept. 5. He had been foreman for Keck-Gonnerman Co., for several years but about eight or nine years ago he established his own foundry.

WILLIAM C. WRIGHT, foundry consultant of the National Founders' Association, Chicago, for the past 21 years, died in that city Sept. 9.

MEETINGS

SOCIETY OF AUTOMOTIVE ENGINEERS
National production meeting. Detroit, Mich., Oct. 7-8. John A. C. Warner, secretary, 29 W. 39th St., New York.

NATIONAL SAFETY COUNCIL
Twentieth Annual Safety Congress, Chicago, Ill., Oct. 12-16. W. H. Cameron. secretary, 20 North Wacker Drive, Chicago.

SOCIETY OF INDUSTRIAL ENGINEERS
Annual meeting, Pittsburgh. Pa., Oct. 14-16. George C. Dent, secretary. 205 W. Wacker Drive. Chicago. Ill.

GRAY IRON INSTITUTE
Fourth annual convention. West Baden Springs Hotel, West Baden Springs Ind. Oct. 15-16. J. Arthur Tuscany, secretary, Terminal Tower Bldg., Cleveland.

AMERICAN GEAR MANUFACTURERS ASSOCIATION
Semi-Annual Meeting, William Penn Hotel, Pittsburgh, Pa., Oct. 15-17. T. W. Owen, secretary, 3608 Euclid Ave., Cleveland, Ohio.

STEEL FOUNDERS' SOCIETY OF AMERICA, INC.
New York meeting. Oct. 22. Granville P. Rogers, managing director. 932 Graybar Bldg.. New York, N. Y.

SOCIETY OF AUTOMOTIVE ENGINEERS
National transportation meeting, Washington, D. C., Oct. 27-29. John A. C. Warner. secretary, 29 W. 39th St., New York, N. Y.

AMERICAN MANAGEMENT ASSOCIATION
Industrial marketing conference, Hotel Statler, Cleveland, Ohio, Nov. 11-13. Headquarters, 20 Vesey St., New York. N. Y.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS
Annual meeting, Engineering Societies Bldg., New York, N. Y., Nov. 30-Dec. 5. Calvin W. Rice. secretary, 29 West 39th St.. New York. N. Y.

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Opportunities for Future Business

Ill., Aurora—Chicago, Burlington & Quincy R. R., 547 Jackson Blvd., Chicago, plans reconstruction of shops here destroyed by fire. Estimated cost $350,000. A. W. Newton, Chicago, Ch. Engr.

Ind., Fort Wayne—Standard Oil Co., awarded contract for the construction of a service station at Barr and Washington Sts. Estimated cost $50,000.

Ia., Corning—Iowa State Highway Commission, L. M. Martin, Dist. Engr., Monpareil Court Bldg., Council Bluffs, will soon award contract for the construction of a maintenance garage here.

Ia., Dyersville—Iowa State Highway Commission, J. A. Paulsen, Dist. Engr., 503 Marsh-Place Bldg., Waterloo, will soon award contract for the construction of a maintenance garage here.

Ia., Sibley—Iowa State Highway Commission, E. W. Dunn, Dist. Engr., Court House, Sioux City, will soon award contract for the construction of a garage here.

Ia., Sioux City—E. V. Moone, City Clk., will receive bids until Oct. 2 for the construction of a 1 story, 60 x 125 ft. service garage and storage building. Estimated cost $30,000. G. B. Hilgers, 502 United Bank Bldg., Archt.

Ia., Sioux City—Churchill Mfg. Co., G. M. Churchill, Pres., 421½ Pearl St., plans to remodel factory building at 311 Douglas St. Estimated cost $15,000.

Me., Bangor—Charles Murray, 18 West Broadway, will build a 1 story garage and service station on Franklin St. Estimated cost $50,000. Victor Hodgins, 39 Hammond St., Archt. Work will be done by separate contracts.

Md., Baltimore—Baltimore Ship Repair Co., 821-23 Key Highway, manufacturers of boilers, tanks, steel hulls, etc., has work under way on the construction of a new 30 x 70 ft. machine shop. Estimated cost $40,000. Noted Aug. 20.

Mass., Chelsea—Ribock, Borr & Glick, 89 Park St., is having sketches made for a 1 story automobile shop and showroom at Park and Gross Sts. Estimated cost $40,000. Krikyn, Brown & Rosenstein, 120 Milk St., Boston, Archts.

Mass., Franklin—O. R. Vozella, City Mills, is receiving bids (extended time) for a 1 story, 90 x 100 ft. automobile service station and showroom at 42 Central St. here. Estimated cost $40,000. Private plans. Noted Aug. 20.

Mass., Holyoke—G. Reardon, 1545 Northampton St., awarded contract for a 1 story garage at Northampton St. and Beacon Ave., Estimated cost $50,000. Private plans.

Mass., Pittsfield—Pittsfield Electric Co., C. E. Merrill, Pearl St., will receive bids about Oct. 1 for the construction of a 3 story service station, garage and office at Pearl St. and Renne Ave. Estimated cost $75,000. Private plans.

Mass., Springfield—Moore Drop Forging Co., 38 Walter St., awarded contract for a 1 story, 80 x 150 ft. machine shop on Wason Ave. Estimated cost $40,000.

Mass., Whitman—United Shank & Findings Co., c/o United Shoe Machinery Corp., 140 Federal St., Boston, is receiving bids for addition and alterations to factory. Estimated cost $40,000. C. W. Hull, c/o Owner, Archt.

Mass., Worcester—Vellumoid Co., 54 Rochdale St., awarded contract for 1 story, 30 x 65 ft. addition to factory.

Mich., Houghton—Oliver Marion, City Clk., will soon receive bids for a 2 story, 60 x 80 ft. garage and repair shop to house city equipment.

Minn., Rochester—A. F. Wright, City Clk., awarded contract for the construction of a 1 story service garage and storage building. Estimated cost $15,000.

Minn., Stillwater—State Dpt. of Administration and Finance, H. W. Austin, Purch. Comr., State Capitol, St. Paul, awarded contract for a print shop and garage at State Prison. Estimated total cost $35,000.

Mo., St. Louis—Pittsburgh Erie Saw Corp., 704 South 4th St., awarded contract for a 1 and 2 story, 50 x 254 ft. saw manufacturing plant on Tower Grove. Estimated cost $80,000.

N. Y., Brooklyn—Antonio Panosa, c/o A. H. Schwartz, 90 John St., New York, plans the construction of a 100 x 120 ft. service garage here. Estimated cost $40,000. O. Goldshlag, 55 West 42nd St., New York, Archt. Noted Aug. 27.

N. Y., Buffalo — Meyer-Smith, Inc., 408 Broadway, awarded contract for the construction of a 3 story, 90 x 200 ft. industrial building, including storage and display rooms at 408 Broadway. Estimated cost $100,000.

N. Y., New York—Lagner-Salmon, Inc., c/o I. Lagner & Son, 60 East 42nd St., Contrs., will build a 4 story garage at 348 West 27th St. Estimated cost $150,000.

N. Y., Syracuse—Syracuse Lighting Co., 421 South Warren St., is receiving bids for the construction of a maintenance shop and service building on Erie Blvd. Estimated cost $500,000.

O., Girard—Pennsylvania R. R., Broad Street Station, Philadelphia, Pa., plans the construction of shops here. Estimated cost $500,000. T. J. Skillman, Philadelphia, Ch. Engr. Maturity indefinite.

Pa., Allenport—Pittsburgh Steel Co., H. D. Williams, Pres., Union Trust Bldg., Pittsburgh, plans the construction of a tube mill here. Estimated cost $1,000,000. Victor Chartner, Monessen, Engr. J. D. Case, Supt. of Monessen plant, in charge of structural work.

Pa., Canonsburg—West Pennsylvania Power Co., West Penn Bldg., Pittsburgh, awarded contract for a 1 story, 80 x 95 ft. garage and stores building at Pike St. and College Ave. here. Estimated cost $40,000.

Pa., Pittsburgh—William Baehr Motor Co., c/o R. M. Reutti, Whitfield Bldg., Archt., awarded contract for a 1 story, 90 x 100 ft. garage at 5548 Center St. Estimated cost $40,000.

Pa., Pittsburgh—Leopold Vilsack Estate, 424 North Highland Ave., awarded contract for a 2 story, 50 x 100 ft. dairy and creamery and 1 story, 35 x 100 ft. garage at 6465 Hamilton Ave. Estimated cost $60,000. Highland Dairy Co., 5135 Penn Ave., Lessee.

R. I., Bristol—Herreshoff Mfg. Co., 13 Burnside St., Bristol, c/o E. M. Corbett, 49 Purchase St., Fall River, Mass., Archt., manufacturers of yachts, is receiving bids for a 2 story plant. Estimated cost $40,000.

R. I., Providence — State Board of Public Roads, awarded contract for the construction of a 2 story maintenance and service building. Estimated cost $50,000.

Tex., Duncan Field — A. W. Parker, Constructing Quartermaster, Randolph Field, received lowest bid for the construction of a 450 x 560 ft. engineering shop, dope house, dope storage warehouse, warehouse, etc. here from O. P. Montgomery, Dallas. $676,000. Noted Sept. 17.

Tex., San Antonio—Board of Education, Lavaca St., is having plans prepared for the construction of a junior high school, including manual training shops, etc., at Huisache and Mulberry Sts. and Lake Blvd., Phelps & DeWees, Gunter Bldg., A. B. and R. M. Ayres, Smith-Young Tower and R. Kelly, Milam Bldg., Archts. L. D. Royer, Smith-Young Tower, Engr.

Tex., San Antonio — Board of Education, Lavaca St., is having plans prepared for the construction of a senior high school including manual training department, etc. at Astor and South Pine Sts. Estimated cost $800,000. R. H. Cameron, Majestic Bldg., G. Willis, Builders Exchange Bldg. and H. Green, Alamo National Bank Bldg., Archts. L. D. Royer, Smith-Young Tower, Engr.

Wash., Seattle—National Steel Construction Co., J. Wilson, Pres., 425 Frontenac St., has work under way on reconstruction of 60 x 150 ft. factory and 40 x 90 ft. galvanizing plant destroyed by fire. Loss $85,000. Noted Sept. 10.

Wash., Seattle—Pacific Door & Mfg. Co., plans reconstruction of factory recently destroyed by fire. $25,000. Work will start at once.

Wash., Tacoma—Cavanaugh Lumber Co., C. Cavanaugh, Pres., plans to rebuild plant recently destroyed by fire. Loss $65,000.

Wis., Sparta—Monroe County, A. L. Nicol, Clk., will build a 1 story machine shop near Milwaukee depot. Estimated cost $25,000. Work will be done by day labor.

Ont., Hamilton — Board of Education, City Hall, plans the construction of a 3 or 4 story technical and commercial school on Sanford Ave. Estimated cost $300,000. B. H. and F. 408 Broadway. Estimated cost $100,000. Prack, 36 James St.., S., Archts.

Ont., Newboro—Thomas S. Walker, plans the construction of a sawmill and cheese box factory.

Ont., Toronto—City plans a new garage in north end of city, also extension to garage and repair shop on Dundas St. E., etc., for street cleaning department. Estimated total cost $192,000. R. C. Harris, City Hall, Engr. Part of work will be done by day labor and part by contract.

Ont., Toronto—Evening Telegram, Bay and Melinda Sts., awarded contract for the construction of a 2 story garage on Seaton St. Estimated cost $100,000.

Ont., Toronto—The Toronto Daily Star, 80 King St. W., awarded contract for the construction of a garage at Albany Ave. and Dupont St. Estimated cost $100,000.

T. H., Wheeler Field—Constructing Quartermaster, Fort Shafter, Honolulu, will receive bids until Oct. 15 for the construction of four air corps hangars, machine shop, warehouse, assembly buildings, etc., here. Estimated cost $500,000.

Russia—Union Socialist Soviet Russia, c/o Amtorg Trading Corp., 261 5th Ave., New York, N. Y., will soon start work on the construction of car building plant at Nizhni Tagil in the Urals. Estimated cost to exceed $1,000,000. Work will be done by technical aid contracts.

Equipment Wanted

Mass., Cambridge (Boston P. O.)—Pill Hardware Co., 730 Massachusetts Ave.—15 floor sanding machines.

Mass., Wellesley—T. J. Murray, 33 Cedar St. —power feed band saw, Dowel machine and four-sided moulder, 6 to 8 in.

N. Y., New York—W. C. Martin, Supt. of School Buildings, Board of Education, Flatbush Ave. Ext. and Concord St., Brooklyn.—will receive bids until Sept. 28 for machinery and tools, equipment and supplies for Walton high school, Reservoir and Jerome Aves., here.

Ont., Orangeville—Armstrong Foundry & Machine Shop, Ltd., U. W. Christie, Mgr.—equipment for proposed plant.

N. Z., Wellington—Department of Public Works—will receive bids until Dec. 1 for one electrical heating furnace for annealing cast iron Pelton wheel buckets.